Issued Weekly by the

Hill Publishing Company

JOHN A. HILL, Pres. and Treas. ROB'T MCKEAN, Sec'y.

505 Pearl St., New York.
6 Bouverie St., London, E. C.
Unter den Linden 71, Berlin.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

During 1910 *we printed and circulated* 526,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for March, 1911, *was* 40,250 *copies.*

April 1	11,000
April 8	9,750
April 15	9,750
April 22	9,750

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE

Editorials:
The Situation in Copper ... 793
The Congress of Technology ... 794
Metallics—By the Way ... 795
Mr. Fielding on Copper ... 796
Florida Phosphate in 1910 ... 796
Broken Hill South Silver ... 796
Correspondence and Discussion: The Cuyuna Iron Range .... Diamonds in British Columbia .... Seeking Employment .... Sampling Ore in Tunnels ... 797
Details of Practical Mining: *Ejecting Sludge from Drill Holes ..A Steam Sample Drier .... The Goldfield Consolidated Bullion Refinery .... *A Safety Gate for Pit Cages .... *Wireless Telegraphy for Mines .... *Shaping Chuck Bolts .... Belt Dressings .... Standard Cost Sheets .... Borehole Deflections .... *Drifting with Stope Drills .... Furnace for Sharpening Drills .... A Skipway for Handling Supplies ... 799
Duty on Lead Zinc Ores ... 803
Yellow Pine District, Nevada ... 803
Report on Transvaal Mining ... 804
Rio Tinto Company ... 804
Operations at Valdez, Alaska ... 804
Outlook for Mining Legislation ... 805
Old Dominion Company ... 805
Iron and Steel in France ... 805
*Blowing In Silver-Lead Furnaces. *L. B. Harrison* ... 806
Award in Silver King Suit ... 808
Great Northern Iron Ore ... 808
*Present Status of Porcupine District ... 809
Cornwall Mining Notes ... 811
Gem Production in the United States ... 811
*Gold Dredging near Ruby, Montana 812
*Boston Consolidated Mill—I. *Claude T. Rice* ... 816
Testing for Tellurium in Minerals ... 820
Conditions of Steel Work Employees 820
Copper Queen Power Costs ... 820
Labor at Bituminous Mines. *Washington Correspondence* ... 821
Indiana Coal Production ... 821
Explosion at Banner Mine ... 821
Friction of Air in Mines. *F. Ernest Brackett* ... 822
Taxing Anthracite Coal ... *P. M. Greer* ... 824
Delaware, Lackawanna & Western ... 825
Mine Explosion in Kansas ... 825
Personal, Obituary and Societies ... 826
Editorial Correspondence ... 827
Mining News ... 829
Markets ... 834

Illustrated.

The Engineering and Mining Journal

APRIL 22, 1911.

The Situation in Copper

The refinery statistics for March were a grave disappointment, especially in the huge production reported. This has led to doubt as to the good faith of the producers in carrying out their promises of curtailment and has naturally excited the inquiry: If production jumped to 130,500,000 lb. in March what may it leap to in April?

Fortunately there exist data in the statistics of smelters' production, reported monthly by the JOURNAL, that illuminate this phase of the situation to some extent. Our statistics have been compiled with fullness since last Septemer. Comparison of them with the refiners' statistics shows the following:

Month	Smelters	Refiners
October	120,293,518	126,469,284
November	122,660,608	119,353,463
December	126,304,278	123,339,219
January	111,411,766	115,696,591
February	115,948,836	109,828,297
Totals	596,619,006	594,686,854

The above comparison must not be made the basis for any minute deductions. The refiners' statistics are precise. The smelters' totals are estimated to the extent of about 12½ per cent. and consequently involve some chances for error. We may, however, safely deduce two things, viz. (1) the average production has lately been about 119,000,000 lb. per month, a figure to be held in view rather than those for any single month, which are erratic for several reasons; and (2) there can be no question about there having been a curtailment by the leading producers, because that is shown in the individual figures making up the smelters' total; but the curtailment was based upon a maximum attained last July, not upon an average, and apparently some of the minor producers have increased their outputs, offsetting much of the curtailment that was actually made.

As the production figures should be considered only over a period, so with the deliveries. In 1910 the average domestic deliveries were about 62,000,000 lb. and the foreign about 60,000,000. During the first quarter of 1911 the respective averages are lower in both cases. Europe has been eating up the invisible supply of metal shipped thither in excess of immediate demand, and in America there has been a contraction in business generally, in which copper manufacturing has, of course, participated. If the deliveries should now rise to the average of 1910 they would but little exceed the present rate of production, and the new production is looming into sight.

On the face of it this gives a dark outlook and the market since early in the year has consistently reflected the forebodings of evil. With the leading seller holding aloof, the others have been able to dispose of their partial supply only at concessions in price and we now find the market substantially on a 12-cent basis. What next is to be expected?

Broadly speaking the future depends upon supply and demand, and upon nothing else. If demand should not increase a lower level of price is inevitable, because the supply will continue and even will increase. At a lower level of price the only things to reverse the trend of things are a stimulation of consumption or an arbitrary curtailment of production. The history of copper in the last 20 years has shown that no low level of price has ever curtailed production automatically. Of arbitrary curtailment by agreement there is at present no prospect whatever, the leading producing interests being more hostile than ever. We can look, therefore, only to an increased development of consumption.

Technically the immediate future of the market depends chiefly upon the attitude of the largest selling-interest. This has sold relatively little copper for a long time, and the uncertainty as to what it may do hangs over the market like a cloud. If it should negotiate a large quantity at a price inducing consumers and speculators to participate in carrying the accumulation, and then should declare its firm intention to hold for a higher price, and ability to do so, the

situation would be cleared up, temporarily at least, and there doubtless would be a rally.

The economic effect of such a transaction would be to interest speculators and induce them, together with manufacturers, to shoulder part of the load of carrying the surplus, which for a long time has been borne by the producers alone, the manufacturers having well recognized the situation and having been convinced of their ability to secure cheap copper whenever they wanted it. But while the natural trend of the market might be checked or reversed by such operations they would be only temporary in their effect if they ran counter to the current determined by demand and supply.

It may be that the near future is not really so dark as it looks today. Good business continues in Europe, which ought by this time to have made large inroads into its supply and be ready to take a good deal of copper from here, while there is some evidence that we are beginning to recover from the recession in business in this country. A clearing-up of uncertainties that would release the capital that is ready for new enterprises might produce a sharp movement upward, and there is always the chance that something unexpected, of favorable effect, may happen. Although the prospect for copper is gloomy at the moment a quick reversal of conditions would not be wholly surprising. Back of all are the signs, fraught with great importance to the copper industry, that we may be approaching the era of railway electrification.

The Congress of Technology

There was a noteworthy gathering in Boston last week when the Massachusetts Institute of Technology celebrated the 50th anniversary of the granting of its charter. That was on April 10, 1861. A few days later the Civil War began and public attention was diverted from new educational plans, but although thus delayed, Rogers and his associates went on with the development of their plans and in the course of a few years the Institute became an active factor. Its first class was graduated in 1868. The subsequent record and achievements of the Institute are well known and well recognized by the world.

The Massachusetts Institute of Technology is not the oldest of American technological schools, but it is among the oldest. It is now among the largest and has ever been among those of the highest standing. It is unique in the trend of its educational policy, which has approached that of the older colleges, minus their attention to the classics and the belles-lettres, more closely than that of any other purely technical school that we think of. It has ever been the intention of the governors of the Institute to train men to be engineers rather than members of a superior class of artisans, and it has been recognized that this implies a thorough grounding in the fundamentals of pure science and the endowment of a breadth of vision covering general economic principles and some knowledge of the humanities. Under the leadership of such men as William B. Rogers and Francis A. Walker this was bound to be so.

It was a happy thought to commemorate the semicentennial of the Institute by calling a Congress of Technology, bringing together the men, trained in applied science at the Institute, who have gone forth from their alma mater and made their mark in the world. The program included sessions covering two days, the first being devoted to introductory exercises and the second to the reading of papers by the alumni of the Institute. Of these 70 were scheduled. They were divided among six sections and were carefully scheduled as to time, so that visitors could arrange their own program, and pass from section to section.

We fancy that the managers of the congress themselves were surprised by the magnitude of the attendance. It was necessary to transfer the second session of the section on "Administration and Management" to a larger hall. The papers that were presented were of an extremely high order, many of them being remarkable for their breadth of view and their revelation of scholarly attainment such as is hardly to be expected from the graduates of a purely technological school. In thus presenting a sample of the kind of men that the training of the Institute has produced, the Congress of Technology was an undoubted success.

The activity of the alumni of the Institute has covered all fields of applied science, and in each of the fields they have achieved distinction. In our own field of mining and metallurgy we need only refer to such men as Professor Richards, himself the oldest living alumnus of the Institute, who has attained the highest position in the art of ore dressing and has not only enriched the world by his contributions to literature but also has made discoveries of principles and inventions of apparatus that probably will lead to a saving of a huge quantity of valuable minerals that otherwise would go to waste; Henry M. Howe, whose contributions to the metallurgy of steel have become classic; F. W. Wood, president of the Maryland Steel Company, who has been prominent in the development of a great metallurgical enterprise and instrumental in the devising of processes for the utilization of the great bodies of chromiferous iron ore, that are destined to play an important part in the iron and steel industry; H. H. Campbell, an authority upon the open-hearth method of steel making and the inventor of a tilting furnace, useful in the duplex process, essential in the Talbot process and coming into use in the making of electric steel; Albert Sauveur, first in the United States to take up metallography in connection with the manufacture of steel; Jasper Whiting, a pioneer in the manufacture of cement from blast-furnace slags; Charles W. Goodale, the manager of a great copper-mining and smelting enterprise.

These are only a few of the men owing their training to the Massachusetts Institute of Technology who have done great service to the world in the art of mining and metallurgy. During the first 25 years of the history of the Institute its classes were small and its alumni of the years earlier than 1890 are relatively few in number. Since then there has been a great enlargement and the younger men have been rapidly coming to the front. Already many of them are matching the successes of the older men. The history of the Massachusetts Institute of Technology is a conclusive demonstration that the method of education inaugurated by Rogers is a useful one and that the arts and sciences and the welfare of the world have been immensely improved by its production of men who can do things.

We commend Mr. Fielding's recent remarks, published elsewhere in this issue, to the attention of some of our American copper producers.

Metallics

None of the alloys of cobalt and copper are true chemical compounds.

Manganese steel should be used for the cores of electromagnets for cranes, as it demagnetizes instantly when the current is shut off.

Lead is hardened by relatively small additions of tin. An alloy containing 7 per cent. of tin is about as hard as pure tin. The maximum hardness is attained with a half-and-half mixture.

The consumption of zinc at the San Rafael y Anexas precipitation plant at Pachuca, Mex., is 334 grams per metric ton of ore or 686 grams per kilogram of mixed gold and silver precipitate, the ratio of the metals in the ore being 374 to 70,400.

If air-hammer drill steels, stamp-mill cam shafts and other steel parts subjected to intense vibration or receiving repeated blows are removed occasionally and heated to a dull red, then allowed to cool very slowly, the breakage from crystallization would be materially reduced.

Owing to the small extent and discontinuous nature of the deposits, manganese mining in the United States is unimportant. The ore must usually be either washed, or sorted, or both. Single pockets are of small extent and are soon exhausted, which discourages the erection of expensive concentrators.

When cement undergoes a prolonged shipment through humid and tropical climates, it rapidly deteriorates if shipped in sacks or barrels. For this reason cement clinker is shipped to Panama and ground there for use in canal construction work. Where operations are on too small a scale to warrant the installation of grinding machinery, the ground cement should be shipped in light galvanized iron drums.

In designing assay furnaces in which charcoal is to be burned due regard should be observed as to the nature of the fuel to be used. Hard woods produce charcoal that burns with a short flame, and the fuel bed should be in contact with the muffle; soft woods produce long flame charcoal, the flame of which is hotter than the coals and the muffle should be placed two or three feet above the top of the burning coal.

Pipes supplying water to batteries, wet crushing machines and concentrating tables should be provided with both plug and globe valves. The flow is controlled by the globe valve, which once adjusted should be changed only when the rate of flow changes. Water is shut off and turned on by the plug valve. By this arrangement the time required to adjust valves is saved whenever the water is to be shut off for a time. The plug valve should always be full opened.

By the Way

Alexander Gillies, discoverer of the Hollinger mine, says that there are today in Porcupine two real mines and two near ones; that the other claims run from good prospects to lemons or culls.

Radium promises to become common. Now it is said to have been discovered in the Tatra mountains, near Zakopane, in Galicia. Like all new radium discoveries, this is "as rich as those of Bohemia."

We learn that a "professor" of mind reading is guiding a general of the U. S. Army and a banker in their mining investment. It is difficult to understand why a mind reader should leave the ethereal and sybaritic paths of his profession for mining. Revelations, however, may be expected.

It is reported that a rich silver-lead-copper deposit has been discovered at Meglo, between Binda and Biggar, about 27 miles from Crookwell, in the southern portion of New South Wales. The lode is said to have been traced for two miles and Australian enthusiasts are talking about another Broken Hill.

The Philadelphia *Times* is evidently of good discernment, for it gives the following dialogue: Mining Company President—Have you seen our annual statement? Friend—Yes. Now, just between ourselves, I'd like to ask you one question. President—Certainly. Friend—Just what is your exact financial condition?

The U. S. Bureau of Mines is circularizing 2000 of the largest consumers of coal in the United States in an endeavor to collect statistical information on the causes of spontaneous combustion. The information thus obtained is to be carefully studied and the results are to be incorporated in a bulletin to be issued by the Bureau of Mines.

The way of some "mining promoters" is now rough and rocky. The members of A. L. Wisner & Co., were "pinched" a few weeks ago and William G. Motley was gathered in on April 4. The Wisner concern had long been notorious. Motley's latest "promotion" was the Allegheny Quartz and Channel Mining Company. His "sucker" list is said to have been developed to a high degree of perfection.

A miner from New Guinea is reported as having expressed himself in a very sanguine way about the future of copper mining in Papua, especially in the region that extends from beyond the Latoke river along the Astralobe range, about 30 miles in length by eight miles in width. "Plenty of prospectors," he says, "have discovered splendid shows, which they have covered up, pending an advance in the price of the metal." Alas! that all prospectors are not so considerate.

They are trying to foment a Porcupine boom in Wall Street, says the *Boston News Bureau*. Porcupine claims already are quoted for more by a hundred millions than all the gold that can be taken out in a generation. A Curb broker wired a man in the West the other day, "Bank rate 4," and he promptly responded by telegram, "Buy me 500 at not above 4¼." He thought it was a new Porcupine proposition. The *News Bureau* further remarks that Federal Mining and Smelting has recently come up from under 20 to above 30. John D. Rockefeller bought the control of this company a few years ago, at around $66 per share. He sold it to the Guggenheims at $122½ per share for $3,600,000 share capital out of a total of $6,000,000 capital. It afterward sold up to 199. Why should one seek Porcupine mining stocks when he can get such fluctuations in a lead-mining proposition?

The Massachusetts legislative committee on mercantile affairs has decided to report a bill which provides that any mining company, before it can list its stock on the Boston Stock Exchange or Boston Curb, must file with the commissioner of corporations a sworn statement giving the facts about the property of the company, the location of the mine, the shares owned by each stockholder, etc.; that after the annual meeting a sworn statement of the condition of the property must be filed; that at the request of 25 per cent. of the stockholders the company must submit its properties to examination by an expert engineer; that the officers of the corporation shall be personally liable for impairment of capital through mismanagement; and that brokers on the exchanges who deal in a stock which has not complied with the law shall be subject to a fine or imprisonment.

The recent battle of Agua Prieta may be unique in the history of warfare, inasmuch as it was fought right along the line of a neutral country into which shots were directed and unfortunately killed and wounded some Americans who were simply attending to their business. The Copper Queen smeltery seems to have been considerably riddled. The following excerpt from a newspaper account of the battle is picturesque. The rebels swung up along the international line, taking possession of the Mexican guard house, which the Federals had made their ammunition magazine. A squad of 15 fought from this shelter with Lopez commanding. This house is only 70 ft. from the line, where hundreds of Americans were standing. As the rebels wheeled around to this, it brought the Federal fire from Agua Prieta directly toward the American custom house. Telephone poles were struck, shot dug up the sand on all sides, but the sightseers, mad with the enthusiasm, stood their ground.

Mr. Fielding on Copper

Charles W. Fielding, chairman of the Rio Tinto board, made the following pertinent and interesting remarks at the general meeting of his company in London on April 5:

The operations at Rio Tinto for the removal of overburden have been carried on as usual during the year under review, and preparations for the future are well ahead. In some of the overburden we have come across material that is more difficult to break up than that met with in former years. In dealing with this the increased use of machine drilling has been employed, and the introduction of these and of other improved methods are creating economies in opencast working generally. During the past year's mining operations silicious ore has been met with in larger proportion than usual. This ore gives up most of its copper by local treatment, and is profitable to work; but, as it occurs intermixed with ordinary ore, it has in any case to be mined, and then selected out from the pyrites. For this reason, and to get sufficient pyrites to meet the demands of our customers who make sulphuric acid, the total quantity of ores mined had to be increased during 1910; but the average copper contents of the whole of the ores mined was rather lower than in 1909. Methods for extracting copper from all classes of ores treated by us in Spain are constantly receiving attention, and improvements are gradually being introduced, with a view to recover their copper contents more economically and quickly, and to render the washed pyrites sooner available for the use of sulphuric-acid makers. When dealing with millions of tons, the introduction of improvements must of necessity be slow; but at the same time a fractional saving runs into very large figures over the quantity dealt with.

The only adverse feature during the year has been the price obtainable for copper. Consumption has been satisfactory, and there is no doubt that copper is constantly being used in ever-increasing quantities. On the other hand, the world's stocks of copper are still higher than they need be, and miners of copper are not able to hold out for higher prices while stocks are in excess of consumers' needs and the production is upon a scale that does not rapidly reduce stocks to a figure which would beget confidence. A few of the larger mines and groups in America have undoubtedly reduced their production since last autumn, but the total output figures of that continent indicate that other and smaller mines are trying to keep going by mining the largest quantity of copper they can, in order to reduce the cost of each ton they produce, even if they make no profits and exhaust their assets. This policy, while suicidal to themselves, is naturally very detrimental to the interests of copper producers who, while still able to pay dividends, yet have their profits considerably reduced.

As to the future price of copper I cannot speak with certainty. Stocks are being reduced somewhat, and I believe that the larger American producers fully realize that with a general and quite moderate further reduction of the total output on their side the excess stocks would rapidly disappear. This would in the near future put copper at a price that would give them reasonable returns. From an analysis of the published returns of the United States copper mines, a number of companies, having over £60,000,000 of capital, can be picked out, which together produce more than 25 per cent. of the world's output of copper, and which on the average of recent years have paid less than 2 per cent. in dividends to their shareholders. I do not think that it is far wrong to put 20 years as the average effective life of the ordinary mine working a vein or an isolated lense of ore. Therefore, in the last three years these American mines in question have probably exhausted nearly a sixth of their wealth for no ultimate return, and they have paid, as I have said, less than 2 per cent. per annum of their working capital. Fortunately, Rio Tinto is not in a like case, as, even at present prices, and through our exceptional conditions, we are able to make very good profits; but if I were chairman of one of those mines in the above unfortunate category, I should not like to meet shareholders today, and have to confess that, for want of a little coöperation and slight adjustment of output among the mines producing dear copper, the shareholders' assets were being ruthlessly squandered, year after year, without hope of return.

Florida Phosphate in 1910

The production of phosphate rock in Florida passed the 2,000,000-ton mark for the first time in 1910, in spite of the low prices prevailing, $5 to $6, f.o.b. mines, for hard rock, and $2.75 to $3 f.o.b. mines, for pebble. The total production in 1910, according to the Florida State Geological Survey, was 2,029,797 tons, as against 1,826,151 in 1909, the increase being entirely in the pebble, while hard-rock production actually declined. Stocks decreased at the hard-rock mines by about 100,000 tons, so that total shipments are in excess of the production, amounting to about 2,081,936 tons, of which about half was for domestic consumption.

There were 20 companies operating in the hard-rock section for part or all of 1910, and 15 in the land-pebble district, and at least one new company preparing for operations in the latter field. Thirty-seven plants were operating in the hard rock at the beginning of the year, 45 at the end.

Broken Hill South Silver

The Broken Hill South Silver Mining Company, of New South Wales, has reported for the half year ended Dec. 31, 1910. The company is continuing its customary dividends of 10 per cent. quarterly, and expects to pay an additional 5 per cent. for the quarter ended March 31, 1911. In addition 10 per cent. per annum is written off for plant depreciation. During 1910 there were 311,874 tons of ore extracted, while the ore reserves are estimated at 3,000,000, which amount it is expected to increase. The ore raised carried 14.9 per cent. lead, 12.9 per cent. zinc, and 6 oz. silver per ton. An accompanying table shows the classification effected by the concentrating plant. The lead recovered in concentrates is 0.3 per cent. more than in January-June, 1910, while 2.9 per cent. more of the silver was recovered than in the first half of the year.

CONCENTRATION AT BROKEN HILL SOUTH SILVER MINING COMPANY

			Assay			Metal Contents			Proportional Distribution		
Products	Tons	Per Cent.	Pb, Per Cent.	Ag Oz.	Zn, Per Cent.	Pb, Tons	Ag, Oz.	Zn, Tons	Pb, Per Cent.	Ag, Per Cent.	Zn, Per Cent.
Concentrates...	28,162	15.7	70.4	21.0	5.5	19,826	591,402	1,549	74.2	55.1	6.7
Zinc tailings...	84,428	47.1	4.1	3.7	18.2	3,461	312,384	15,366	13.0	29.1	66.7
Quartz tailings.	43,760	24.4	2.2	1.4	7.7	968	58,574	3,370	3.6	5.4	14.6
Slimes.....	22,866	12.8	10.7	4.9	12.1	2,447	111,701	2,772	9.2	10.4	12.0
Total.....	179,216	100.0	14.9	6.0	12.9	26,702	1,074,061	23,057	100.0	100.0	100.0

During the half year under review the Amalgamated Zinc (De Bavay's) took the 84,428 tons of zinc tailings shown in the table, and 11,548 of accumulated tailings in addition. The Zinc Corporation in the same period took 11,420 tons of accumulated tailings, assaying Pb, 10 per cent.; Ag, 4.2 oz.; and Zn, 19.3 per cent. It is estimated that there are on hand 1,067,272 tons of tailings to be treated by the Zinc Corporation and 132,076 tons to be treated by De Bavay's.

The U. S. assay office, at Salt Lake City, handled a total of $134,354 in gold and silver bullion during March. During the month 7107 oz. of gold and 4536 oz. of silver passed through the office. Of this amount a little less than half was from Utah mines. The greater part of the remainder came from Nevada camps, with some from Idaho and Wyoming.

Correspondence and Discussion

The Cuyuna Iron Range

From the time of earliest exploratory work up to the present, a period of five or six years, the Duluth correspondent of the JOURNAL has never had a word to say in favor of the new Cuyuna iron range. Such references as he has made have been few indeed and invariably of a pessimistic tone.

In the JOURNAL of April 8 there is one of his characteristic descriptions of conditions, that is not warranted by the known facts. He goes out of his way to say a good word for the Vermilion range, when anyone who is at all posted knows that hundreds of thousands of dollars have been spent there in almost fruitless attempts to add new shipping mines to the five or six that were established 20 to 25 years ago. The Vermilion range, too, has hundreds of acres of outcrops of jasper, greenstone and iron formation to guide the prospector. The government geological maps of that range show a regular crazy-quilt of favorable looking areas for prospecting. It would be a conservative estimate to say that there have been incorporated within the last 25 years, a hundred iron companies to give the public a chance to invest in their stocks and I cannot recall any such that have ever shipped ore. The first ore, discovered on the Vermilion, outcropped. That discovery, followed up, resulted in two or three mines in that immediate vicinity. This was easy compared to exploring on the Cuyuna where a drift mantle covers the ledge to a depth of 50 to 300 ft. over the entire district.

Now, what has the Cuyuna district shown within the brief five or six years of its existence? The Kennedy mine at Rabbit lake will be shipping ore this year. At Crosby there are ledged two large and substantial concrete shafts and sinking is being continued to the required levels on two different properties. Two other concrete shafts are going down in the same vicinity and will be ledged within three months. All five of the above mentioned mines are installing the best modern equipment capable of handling a large tonnage. Other lands on the range have been successfully drilled, marketable orebodies are known to exist and in due time other active mines will be opened. A new railroad (the Soo line) has been built into the district and the dock at Superior is now about ready to receive the first ore which will be shipped within the next few weeks.

In consideration of these facts, I think that the Cuyuna, in a few years, has done well and is entitled to as favorable recognition as its older sister, the Vermilion, which has been in the spot light for the last 25 or 30 years, with all the advantage of the publicity given it incident to the flotation of numerous companies offering stock to the public in the advertising columns of the press, with reading notices thrown in. The Cuyuna range has had no such influence to stimulate work, but some people, interested in that range, have been quietly "delivering the goods" nevertheless. It is true there has been considerable money spent fruitlessly and there will be much more spent in the search for ore, which is a necessary part of the mining game. The district is not a wonder like the Mesabi and never will be, but enough has been accomplished, I am sure, to warrant using a little brighter coloring matter than has so far been applied. C. NEIMEYER.

Duluth, Minn., April 13, 1911.

Views, Suggestions and Experiences of Readers

The remarks of the Duluth correspondent of the JOURNAL on the results of development and the future of the Cuyuna Range iron ores in Minnesota, which were published on page 731 in the issue of April 8, meet my idea of the situation exactly.

There is no question but that, in a contracted area close to the west side of Rabbit lake, there is some good ore, some very good ore; but this immediate vicinity seems to cover all that has so far been found of value. Newspapers here have, from time to time, reported important discoveries and leases, one of the last being a lease to the Inland Steel Company of a property said to contain 20,000,000 tons at a 50-cent royalty. But there was never the slightest warrant for stating any tonnage on this property from the explorations made, and the Inland Steel lease is now, I learn, to be abandoned as worthless.

The same was true of a find that was taken over by the International Harvester Company, where some exceptionally high-grade ore was found—68 per cent. iron and 0.008 per cent. phosphorous—but this, too, was so little that the negotiation was dropped by the Harvester company. The newspapers do not mention these abandonments.

Four shafts are either down or are being sunk on the range, all close to Rabbit lake. One of these shafts is on the Kennedy mine that has developed a large tonnage and begins the shipment of a small tonnage this week to the new docks of the Minneapolis, St. Paul & Sault Ste. Marie railroad.

A second shaft is at the Armour, and a third is to be started at once at the Pine Tree. All these properties are owned by Rogers, Brown & Co. The Inland Steel Company is sinking or is to sink soon, a concrete shaft on Sec. 11, T. 47, R. 27 and Rogers, Brown & Co., will sink on their Interstate property, Sec. 10, still another concrete shaft. While there are rumors that other shafts will be sunk I do not know that any are assured. The Kennedy will be the only shipping mine for this year. CUYUNA.

Duluth, Minn., April 11, 1911.

Diamonds in British Columbia

The brief information given in the Toronto correspondence in the JOURNAL of April 8, seems to me so incomplete to be likely to cause disappointment if, as stated, "some prospectors have started for the district." The following information on this subject is thoroughly dependable: "The diamonds in the rock from Olivine mountain, near Tulameen river, B. C., were found by Robert A. A. Johnston, curator of the Canada geological survey museum, at Ottawa, Ont., while studying the chromite in a specimen for Charles Camsell, one of the Survey geologists, who had done much geological work in the Tulameen district during 1909 and 1910. This is the only authentic discovery of diamonds in Canada. Numerous reports have been received of diamonds having been found in northern Ontario and Quebec, but in no instace has investigation proved the accuracy of such reports. About 10 years ago R. W. Brock, now director of the geological survey, found diamonds in British Columbia, but did not publish a notice of his discovery for the reason that the material was lost before the final combustion test was made. He was, however, sure enough of the nature of the material to lead him to advise prospectors to be on the lookout for diamonds in British Columbia."

It may be added that a press despatch from Ottawa, dated April 10, includes the following: "R. A. A. Johnston has been working for the last few weeks on the samples of rock from British Columbia in which the first Canadian diamonds were discovered. 'The discovery is of no commercial importance,' he said, 'I have found it impossible to separate the diamonds from chromite and other varieties of rock in which they appear in the specimens found, without necessarily breaking them into small pieces. Of

course we could do this by a slow process, but commercially this would be out of the question.'"

Of the chromite deposits, Mr. Camsell reported[1]: "Chromite occurs in varying quantities in the peridotite of Olivine mountain. It appears generally along certain east and west zones, where the peridotite has been most readily altered to serpentine, and occurs in short, irregular veins from half an inch to an inch in width, and in irregular masses or bunches in the dark green olivine. It also occurs in small disseminated crystals in the massive peridotite not connected with any fracturing or fissuring. It is doubtless a differentiation product of the peridotite magma in the process of cooling. In the experience of those working on this peridotite area, some of the best assays for platinum have been obtained from peridotite, rich in chromite. This is in accord with the results obtained by Prof. James F. Kemp in his study of the geology of the platinum deposits." In the year 1900, Professor Kemp spent nearly three months in the district, investigating the geology of the platinum deposits[2] along the Tulameen river.

E. JACOBS.

Victoria, B. C., April 12, 1911.

Seeking Employment

Perhaps the following record extending over a period of twenty years may indicate how the mining student without any "pull" may find employment. Of twelve positions, six I obtained by answering advertisements in mining papers, one I obtained by an advertisement I placed in a mining paper, four through personal acquaintances and one by writing to a company that was just incorporated. This I heard of through a friend. Although I am personally acquainted with many of the best engineers in the country I have never had any help from them.

My experience is that reliable companies do not advertise good positions. They do not have to; their waiting list is too long. Companies may advertise for millmen or mine foremen but not often. I believe it a waste of money for the student to advertise and that if he waits for advertisements to appear so that he may try his luck he may starve before one does appear, and should he answer one and be accepted the chances are that he would be ashamed to tell his best friend the amount of his compensation.

Unfortunately I was of that large class of mining graduates who picked out the mining of the precious metals as a life profession. I say unfortunately because this branch of the profession is greatly overcrowded with excellent men. Good men with years of experience are out of work. I know this for a fact for I am continually receiving applications from men with excellent qualifications who are willing to take any job.

My advice to the young graduate without friends in the business is to consider carefully these two questions. Do I want to live most of my years on the frontiers of civilization and do I wish to lead an honest upright life? If both of these questions are answered in the affirmative the graduate may after many years of hard work attain a position paying about $150 per month; if answered in the negative the individual will be sorely disappointed for on one hand he must remain on the frontiers to work in mines and on the other any advantage gained through dishonest work will be but transitory.

The fact that an engineer has many excellent recommendations is no indication of what position he may be compelled to accept through absolute necessity. The best advice is to make friends among mining and business men in the large cities. The general idea is that if a student gets in and works hard and works to advantage he is sure to come out on top. This I believe to be a fallacy, the poor worker is just as apt to obtain the best positions as the man with excellent qualifications. It is entirely a matter of personal friendship which often depends upon individuality. Without meaning to be frivolous I believe a mining school might with propriety have a course in "mixing" where the student might learn the gentle art of being a "good mixer."

Although mining for the precious metals is a highly technical profession which requires experience and judgment, good positions are obtained, as in any other business, simply through friendships and acquaintances. ENGINEER.

Salt Lake City, Utah, April 5, 1911.

The suggestion that the American Institute of Mining Engineers appoint a committee on employment for the members, made by J. A. Herdy, in the JOURNAL of April 1, is especially timely as I am on the point of leaving for Santiago, Chile, for the Allis-Chalmers Company, and the most valuable feature of my employment file—promptness—will be lost. I shall discontinue it except for positions open along the west coast of South America.

Mr. Herdy's idea seems good, though the fact that Secretary Raymond has not started such a file for aiding those out of work shows that there is something wrong with the idea. As was prophesied in an editorial note, the file would sooner or later attain unwieldy proportions and only that it is a hobby keeps it active and useful.

The "Positions Wanted" columns of such publications as the JOURNAL are useful, though it is not universal practice to use them. I believe it would pay to use "copy" in the shape of numerous letters I have received—letters that include lists of previous engagements as well as an insight to the personality of the writers.

The several engineering employment agencies undoubtedly do much good work, but I have yet to be convinced that it is fair to charge a month's salary for advising an applicant of possible openings. The charge seems out of all proportion to the service rendered.

MARK R. LAMB.

New York, N. Y., April 8, 1911.

Sampling Ore in Tunnels

Recently I have had occasion to read a number of reports on mines where the ore occurred in a broad vein or zone that dipped at a high or nearly vertical angle. These deposits were all situated in hills so that a considerable depth of ore could be developed from a system of tunnels driven at right angles to the strike of the ore and at or near the base of the hill.

The ore exposed in a tunnel of one of these properties was 300 ft. wide and in sampling, the engineer had cut a continuous channel from wall to wall, reducing a bulky lot of ore to one small sample for assay and which was supposed to represent the ore exposed in the tunnel.

It is quite possible to obtain a fair estimate of the value of the ore as a whole by such a method of sampling, but one of the important objects of sampling is to determine whether, in a wide zone of ore, the gold or other metal is uniformly distributed or occurs in shoots, as is often the case.

The grade of the wide zone of ore may be too low to admit of profitable mining, but it may be possible to mine the richer shoots on a small scale of operations with excellent returns.

In order to determine the grade of such ore exposed in a tunnel, one sample should be cut for not more than every 5 ft. of the ore zone. It should be cut at right angles to the walls or, in vertically dipping deposits, parallel with the roof of the tunnel. The entire width of the orebody should be sampled in as many separate cuts, each 5 ft. long, as may be necessary to represent every 5-ft. section of the tunnel through the deposit.

When such samples are assayed and the results written on the assay maps, any high-grade oreshoots are automatically recorded and then the proper interpretation of the results of sampling may be made. From such a map it is at once apparent whether the deposit can be worked as a whole or only the high-grade shoots are of value.

J. A. HERDY.

Chicago, Ill., April 7, 1911.

[1] *Summary Report* for 1909, Canadian Geological Survey, p. 115.

[2] *Bull.* 103, United States Geol. Surv.

Details of Practical Mining

This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent of telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of a pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

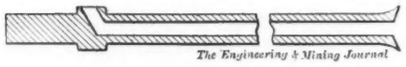
Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

Ejecting Sludge from Drill Holes

BY E. M. WESTON*

A method of ejecting mud and cuttings from a drill hole has been devised by Mr. Tippet, an Australian, that may result in making it possible to use a one-man drill in the mines of the Rand. He conceived the idea of withdrawing the sludge through, instead of forcing water down hollow steel. He intended to bring the sludge right through the machine by means of a suction device which was to be worked by the exhaust air.

One day, while using a rose bit, he



HOLLOW-STEEL BIT WITH SIDE OPENING

noted that when the suction was not operating, the drillings were being vigorously ejected. The sludge evidently entered the hollow in the steel with considerable velocity on the down stroke, the inertia of which was not entirely overcome during the period of the return stroke.

All that is necessary to take advantage of this effect is to employ hollow steel and forge a collar or thickened mass of metal near the shank, then to drill a transverse hole to connect with the central channel at a point just below the chuck.

The steel used with piston drills is 1¼ in. diameter, through which passes a ¾-in. channel. The central channel becomes filled with sludge but does not choke with pieces of rock (granite) even when as large as a 10-c. piece.

It has been found in using steel of this construction, that it loses gage less rapidly. A total of 37 in. of hole was bored by a New Century air-hammer drill in 12 min., operating at 55-lb. pressure, as follows; with 1⅝-in. steel 15¼ in. of hole; with 1⅜-in. steel 16¾ in. and with 1⅛-in. steel 5 inches.

The accompanying illustration shows the enlarged part of the drill below the chuck, the transverse and longitudinal passages.

*Mining engineer, Box 1167, Johannesburg, S. A.

A Steam Sample Drier

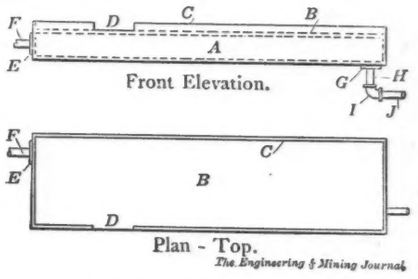
BY CLARENCE C. SEMPLE

The jacket herein described is a modification of the jacket used in the sample-drying room of the Aguascalientes smeltery of the American Smelting and Refining Company. The drying room is in the sampling-mill building, separated from the bucking room by a corridor, and in a place remote from dust. The room is entirely inclosed, lighted by windows and ventilated by a small cupola at the top. The jackets are arranged in rows, one above the other on three sides of the room.

The jacket is made of cast iron; is about 24 in. wide and 54 in. long; the steam space *A* is about 3 in. high; the walls are about ½ in. thick. The upper surface is surrounded by a rim *C* about 1 in. high, except for a width of 6 in. in the front, as shown at *D*. At one end, a pipe flange *E* for a 1-in. or 1½-in. pipe is riveted to make connection with the steam-supply pipe *F*. At the other end and at the bottom of the jacket, a second pipe flange *G* is riveted, in which is screwed a nipple *H* and elbow *I* connecting with the return pipe *J*. The jackets are supported, in tiers of six or eight, one above the other, on a stand made of 1-in. pipe and fittings.

Usually the samples to be dried are contained in light sheet-iron pans about 22 in. square and 4 or 6 in. deep. These pans are placed on the top of the jacket, fitting within the rim. Such samples dry within 12 to 18 hours. When a "rush" sample is to be dried, the pan is not used, but the sample is spread evenly over the top of the jacket, where it dries in not more than two hours. The rim is provided for the drying of such samples. When dry, the sample is scraped into a pan through the opening in the rim at *D*, the fine ore being swept out with a brush. The surface of the jacket is then washed to remove any fine material that might affect the next sample so dried.

Samples of concentrate or heavy sulphide ore may be decomposed to a slight degree if placed in a pan directly in contact with the hot jacket. Such samples should be dried slowly at a low temperature. To dry samples that might be decomposed under the combined influences of heat and moisture, two sticks of wood are placed across and resting on



A STEAM-JACKET SAMPLE DRIER

the rim of the jacket; the pan is placed on these sticks, where the sample will dry slowly with the minimum danger of decomposition.

The usual method of drying samples is to place the pans upon steam coils. The advantages of the jacket are that the resistance to the flow of steam is much less than offered by coils; the area of contact of hot surface is much greater than where coils are used; there is no danger of spilling a part of a sample into those below it; when necessary, "rush" samples may be dried in the minimum time.

The Goldfield Consolidated Bullion Refinery

The new refinery of the Goldfield Consolidated Mines Company has many innovations; in effect, it is a small smelting plant that handles the products of the mill, and does away with the necessity of shipping concentrates and low-grade bullion.

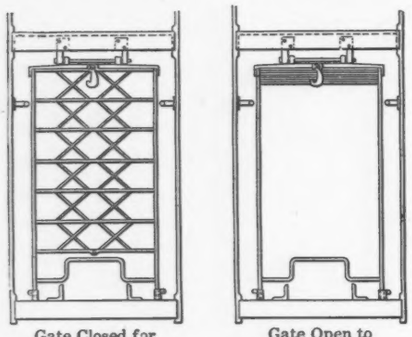
The precipitate from the filter presses is molded into small briquets, then dried in a baking oven. It is then smelted with lead in two small blast furnaces. Silica and old cyanide tins are added to the charge for fluxing.

The slag produced is so low in gold that it may be discarded. The base bullion is cupelled and bullion 0.900 fine is obtained. The products from the cupelling furnace, such as litharge, slag and old cupels are returned to the blast furnaces for recovery of the gold contained.

A Safety Gate for Pit Cages

A safety gate used on pit cages in a number of English collieries is shown in the accompanying illustrations. The cage is closed while hoisting men, though in such a manner as to be readily opened by the banksman, while the gate can be opened by the men in the cage in case of emergency, and when hoisting coal allows the full opening of the cage front to be available for the entrance of coal tubs. The illustrations, says *Colliery Guardian,* show the gate in various positions, as fitted to the cages at the Wharncliffe Silkstone Colliery. The gate is of a collapsible pattern, working vertically, and slides in a strong channel-section frame which is hinged to the top bar of the cage front, and held in position by two swing catches attached to the floor of the cage. The frame remains in this position as long as men are being carried, the gate being closed or opened by simply sliding the trellis up and down.

When the cage is to be used for hoisting coal the catches are released and the whole gate and frame are swung out



SAFETY GATE FOR CAGES

of the way to the top of the cage, where they are secured by means of a strong strap until again required. It will be noticed that in this position also the trellis can be closed up so as not to be in the way when timber is being wound.

The gate is of strong construction so as to afford the necessary protection to the men, but is sufficiently light as to be easily handled. The frame is attached to the cage with no more trouble than the drilling of a few bolt holes for the fixing of the hinges and catches. Should the width of the cage allow of it, the gate can be fitted with a fixed frame, screwed to the side bars of the cage front, though in practice the swinging frame has proved the more satisfactory, and is that usually supplied.

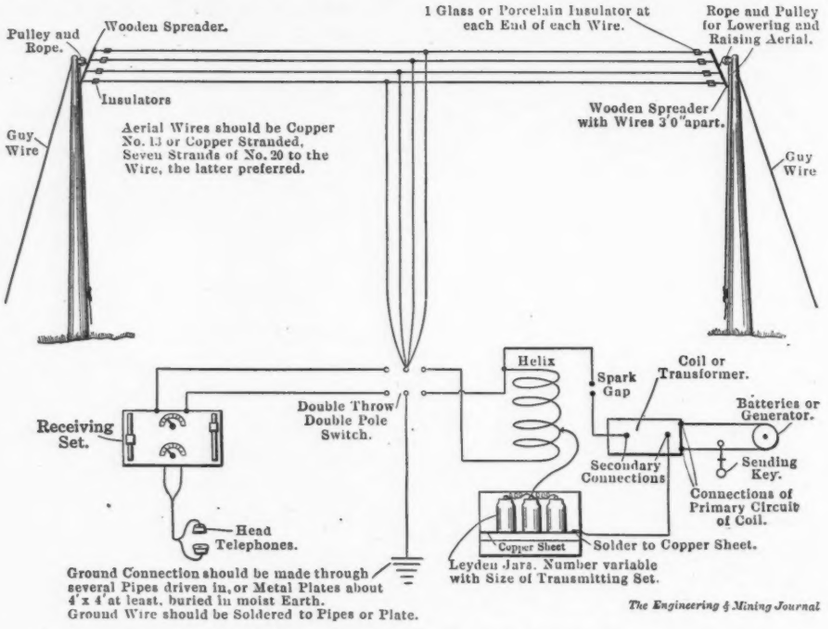
The blast-furnace slag at the Copper Queen smelting works, at Douglas, Ariz., averaged during 1910: Cu, 0.383 per cent.; SiO_2, 36.47; FeO, 41.49; CaO, 3.97; Al_2O_3, 12.27; MgO, 1.98 per cent.; a total of 96.563 per cent. accounted for.

Wireless Telegraphy for Mines

BY J. OWEN SMITH*

In view of the extent to which wireless telegraphy has developed as a means of communication between isolated communities afloat, it is a matter of surprise to find how few mines have taken advantage of this entirely feasible means of communication. A comprehensive system of wireless for the civilized spots of "darkest" Africa is in construction in German East Africa, and the intention is to afford communication between such remote places as Muanza, East Africa; Bukaba, on the Victoria Nyanza; Sabara; and the Cameroons, the ultimate intention being to link up, wirelessly, the whole of German East and Southwest Africa.

To my mind there is a close analogy between these isolated communities of Africa and mines where metallic circuits are not or cannot conveniently be maintained.


Pulley and Rope.
Wooden Spreader.
1 Glass or Porcelain Insulator at each End of each Wire.
Rope and Pulley for Lowering and Raising Aerial.
Insulators
Aerial Wires should be Copper No. 13 or Copper Stranded, Seven Strands of No. 20 to the Wire, the latter preferred.
Wooden Spreader with Wires 3'0" apart.
Guy Wire
Guy Wire
Helix
Spark Gap
Coil or Transformer.
Batteries or Generator.
Double Throw Double Pole Switch.
Receiving Set.
Secondary Connections
Sending Key.
Connections of Primary Circuit of Coil.
Head Telephones.
Copper Sheet
Solder to Copper Sheet.
Ground Connection should be made through several Pipes driven in, or Metal Plates about 4' x 4' at least, buried in moist Earth. Ground Wire should be Soldered to Pipes or Plate.
Leyden Jars. Number variable with Size of Transmitting Set.
The Engineering & Mining Journal

TYPICAL WIRELESS-TELEGRAPH STATION

OPERATION SIMPLE AND INEXPENSIVE

That a wireless-telegraph station can be erected and maintained without any great knowledge of electricity, except that gained by actual experience, is evidenced by the fact that in this country today there are thousands of amateur plants in operation, some of them covering large distances. Neither should lack of knowledge of the telegraph code deter anyone from entering the wireless field, for one can become familiar enough with it in a few weeks to exchange messages slowly.

One of the most important parts of a wireless outfit is the antenna, or aërial wire. This antenna can be of various shapes, but there are three in general use. Of these, two are used on land. One is the flat top, i.e., the wires supported between two poles; and the other the umbrella, the wires running down from one pole and spreading out on all sides. Each has advantages peculiar to its construction; the flat top works better and for longer distances in its own plane, while the umbrella form radiates and receives equally well from all directions. But the flat top, in spite of its directional fault, is generally used, as its form enables the spreading of a much greater amount of wire at the maximum distance from the ground, which is desirable.

The greater the spread of wire and the higher, the more efficient will be the station. It has been found that this follows the rule of squares; thus: If two stations working together have aërials 100 ft. high and both increase them to 200 ft., the signal received in either station from the other will be four times as strong.

SIZE OF WIRELESS AERIALS

To Work, Miles	Hight, Ft.	Length, Ft.
5	20	40
10	40	50
15	60	75
20	70	100
25	85	100
35	100	125
50	100	150

Under average conditions the desired hight and length of aërials for a set of given distances are shown in an accompanying table. These are not hard and fast rules, by any means. Cases have been known where an aërial 20 ft. high has radiated signals for 25 miles. The pur-

*United Wireless testing laboratory, Bayonne, N. J.

pose here is to give an approximate idea of what is necessary to render effective and dependable service.

The primary power for a station is an important problem, and one which frequently is a hard one to solve. Dry batteries are sufficient where the distances are short, say five or 10 miles. For greater distances storage batteries, a source of care and worry, are sometimes used, but the ideal primary power is 110- or 220-volt alternating current. Of course, direct current at these pressures answers, but it is necessary either to transform it to alternating, or else use some kind of an interrupter, as the power to be supplied to a wireless coil or transformer must be either alternating or interrupted current.

POWER REQUIRED FOR WIRELESS TELEGRAPHY

Miles	Sparking Apparatus	Power
5	2-in. coil	Dry batteries
10	4-in. coil	Storage batteries
15	8-in. coil	Storage batteries
20	¼-kw. transformer	A.c.or d.c., 110 or 220 v.
25	½-kw. transformer	A.c.or d.c., 110 or 220 v.
35	¾-kw. transformer	A.c.or d.c., 110 or 220 v.
50	1-kw. transformer	A.c.or d.c., 110 or 220 v.

In an accompanying table will be found the approximate power necessary for the various distances, in connection with the various aërials already outlined.

Cost of Wireless Equipment

The diagram of a wireless station shown in an accompanying illustration will give an idea of what is necessary for a complete outfit. If this were followed and the installing and "tuning up" carefully done, a station so constructed should work constantly with only slight expenditures of money and labor. It is almost impossible to give detailed cost of the complete apparatus unless the local conditions are known. In fact, a station should be designed entirely according to what it is expected to accomplish, and only when this is known can definite cost figures be given. Roughly, a complete station to send and receive reliably for say 15 miles would cost in the aggregate about $125. One for 50 miles, about $300 or $400. After installation there is practically no cost outside of the power consumed in the primary circuit.

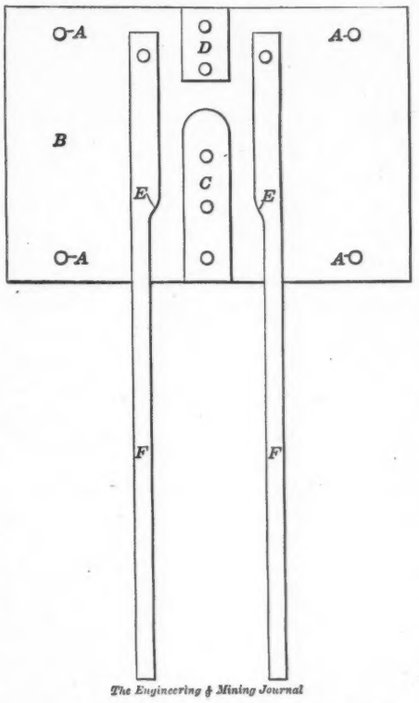
The new Randfontein Central mill with 600 stamps and 16 tube mills is estimated to crush 150,000 tons per month, or a stamp duty of 8.3 tons per stamp per day. The cost of the mill was £1,800,000, about half of which sum was paid for labor. On the basis of the estimated capacity this is equivalent to a cost of $4.80 per ton per annum.

Shaping Chuck Bolts

By H. Lawrence Brown*

The accompanying sketch shows a device for making chuck bolts for machine drills. It consists of the plate *B*, made of 1-in. iron, bolted to a work bench by ¾-in. countersunk bolts *A*. To the plate are riveted the pieces *C* and *D*, of 1-in. material, with a curve in the piece *C* corresponding with the bend desired in the chuck bolt.

The levers *F* are about 2 ft. long and are offset as shown at *E*, where the thread on the bolt begins, in order not to injure the threads while the bolt is being



Device for Shaping Chuck Bolts

shaped. The threaded bolt is heated and placed between *C* and *D*, while the levers are open. Closing the levers to the position shown gives the bolt the proper shape.

Belt Dressings

Most belt manufacturers, according to William T. Plummer, know from bitter experience that more belts are ruined through the use of unsuitable dressings, especially those that stick the belt to the pulleys, than from any other cause. The strongest claims are made for economy, added efficiency, benefit to belting, waterproofing, etc., for most, if not all, of the dressings on the market.

Although the traction of a belt is undoubtedly temporarily increased somewhat by the use of these dressings, even that benefit is extremely temporary, and is lessened, to a great extent, by the difficulty of pulling the belt from the face of the pulley. This is injurious to canvas belting, because it tends to tear the ply of the belt which comes next to the pulley's face; belts have been absolutely ruined in this way, the face ply torn to shreds from the use of sticky dressing.

The proper idea of a belt dressing is not to cover the surface of the belt with any sticky substance, but to dress the belt with some preparation which will keep it soft and pliable without affecting its tensile strength.

The only safe as well as reasonable way is for the belt user to find out what dressing is recommended by the manufacturer of the belt which he wishes to treat, and to use that dressing on that kind of belting in accordance with the directions. In that case the user will probably get the article which is not only best adapted for the particular belt to increase its traction and length of service, but will run no danger of getting an article which is detrimental to the belt.

*Mining engineer, Halle Gold Mining Company, Kershaw, S. C.

Standard Cost Sheets

The standardization committee of the Institution of Mining and Metallurgy on mine accounts and cost sheets, has made the following recommendations[1] in regard to the standardization of working accounts and cost sheets. These recommendations have been adopted by the council, which suggests their use whereever conditions will permit.

The committee recommended that for the sake of convenient comparison, both in working accounts and cost sheets, all expenditure should be classified under the following main heads: (1) Development. (2) Extraction of ore (i.e., mining). (3) Sorting at surface, preliminary crushing and transport. (4) Reduction costs (i.e., ore treatment). (5) Administration charges and general charges at mine. (6) Realization charges on products. (7) Taxes and royalties of all kinds, shown separately. (8) Head-office charges.

The total capital expenditure should also be shown on all general-expenditure sheets.

The subdivision of these main heads into subheads must necessarily depend somewhat upon the conditions, but the advantages of adhering as closely as possible to one form, and departing from it only where necessary, are manifest. The following were suggested as desirable subdivisions:

(1) Development costs need only appear in the general cost sheet in one total, but a detailed sheet should be prepared showing the total expenditure and cost per foot in shaft sinking, driving, crosscutting, raising, winzing and plat

[1]*Bull. No.* 76, I. M. M

(or station) cutting separately, as well as the proportions of these expenditures which are for labor and for materials respectively.

(2) Extraction of ore may be usefully divided into: (*a*) Stoping or breaking of ore, including under subheads: compressed-air and rock-drill costs, labor and supplies, shoveling, etc. (*b*) Timbering, filling excavations and sorting of ore in stopes (if any). (*c*) Hoisting. (*d*) Pumping. Where the cost of pumping is exceptionally heavy, it may be convenient to make this item a main head. The same remark applies to the removal of the overburden when a deposit requires to be stripped. (*e*) Underground tramming. (*f*) Sampling, assaying and surveying. (*g*) General underground maintenance. It is suggested that these subdivisions of the main head should be set out in detail in the general cost sheet, because mining is at once the principal item of working cost and offers the greatest scope for economies.

(4) Reduction costs must be subdivided according to the treatment undergone by the ore, e.g., crushing, amalgamation, concentration, fine grinding, cyaniding sands, slimes treatment, roasting, smelting, converting, leaching, precipitation, etc.; for each of which a detail sheet should be prepared in such form as circumstances may dictate.

(5) Administration may be divided into salaries (general resident manager and clerical staff on the spot), stationery and office general expenses, traveling expenses, insurance and legal expenses, accidents, medical, sanitary and hospital expenses, stabling and sundry transport, etc.

(8) Head-office charges, besides ordinary central-office expenses, will include a great variety of items, such as agency expenses, directors', consulting engineers' and auditors' fees, bank charges, etc., also interest on debentures (if any). The individual items under (5) and (8) are liable at times to merge one into the other.

The committee recommended that all statements as to the quantities and values of stores, ores and products on hand should be certified by the responsible officials, countersigned by the manager of the mine. An independent audit of stores, etc., is advisable from time to time.

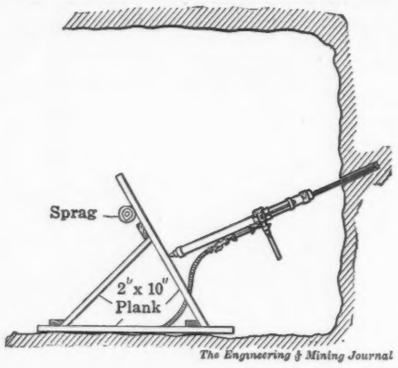
Borehole Deflections

That the deflection of diamond-drill boreholes is due originally to terrestrial magnetism is the assumption of J. S. Curtis (*Journ.*, South African Institute of Engineers, March, 1911). He has shown by experiment that a drill rod, or other similar piece of metal, when rotated for some time in the earth's magnetic field becomes a magnet. The tendency, then, of the end of the drill is to be deflected in a north-south line. Once that the deflection has been begun, by magnetism, the weight of the rods constantly tends to aggravate the deflection, since in a curved hole, this weight would tend to throw the center of the line of rods toward the concave curve, and throw the diamonds toward the inside of the curve. In general, the drill hole, once deflected, tends to become a parabola.

Drifting with Stope Drills

BY HORACE LUNT*

In the Cripple Creek district the small hammer-type air drills have almost entirely replaced the piston drills in stoping. Much of the work is done by leasers, who are not, as a rule, able to maintain a large equipment of tools, and they have found that where the ground is not too hard they can successfully use stope drills for drifting. Sometimes the drill is supported by a sprag across the drift, but a better method is by the simple A-frame, illustrated in the accompanying



FOOT FRAME FOR STOPING DRILL

sketch. This is constructed of 2-in. plank and is held in position by a sprag across the drift as shown. The sprag has to be moved once or twice during a round, but this does not take much longer than changing the hight of the arm on the column of a piston machine. All the holes except the lifters are given an upward slope; they are put in nearly horizontal and cleaned with a blowpipe connected to the air supply.

Furnace for Sharpening Drills

A novel furnace for sharpening drills has been devised by Mr. Allen, who is carrying out the Mine Trials Committee's experiments at the Robinson Deep mine, in Johannesburg. It stands about 5 ft. high and consists of a length of steel pipe about 10 in. in diameter lined with firebrick, with a series of holes for the insertion of drills, cut one above the other in its side. There is a rack to hold the drills and an arrangement for dripping water on them to confine the heat to the end inside the furnace. Air is taken from a blower, or from the compressed-air service of the mine at a pressure of about 8 in. of mercury, and is used to spray the oil, which is fed by gravity from a stand about 6 ft. high; regulating taps control the relative quantities of oil and air supplied to the furnace, so that the heat can be perfectly regulated.

In the Robinson Deep this furnace heats 2800 pieces of ⅝-in. hand steel per shift and keeps four blacksmiths employed. It burns one case of paraffin oil (8⅓ imp. gal.) per shift, costing here about 11s. The economy of the furnace is chiefly due to the heat in the upper part of the furnace being utilized to warm drills, which are gradually moved down into the hottest zone. A great advantage is the easy regulation of the heat, that only the tips of the drills need to be heated and that burning of drills, due to overheating, which is so easy in a coal furnace when operated by a Kafir, is largely eliminated. This furnace could be made at any mine and could be adapted for use for much blacksmith work, and especially for welding. It could, as far as its form is concerned, be adapted for use with producer gas with but slight modifications.

*Mining engineer, Gazette building, Colorado Springs, Colo.

A Skipway for Handling Supplies

BY JESSE SIMMONS*

When the Wasp No. 2 Mining Company, at Flatiron, Black Hills, S. D., came to reconstruct the milling plant that had been destroyed by fire, the problem of delivering the large amount of lumber, cement, machinery, etc., was a big obstacle to be overcome. The top of the millsite is at the crest of Whitewood cañon, on the easterly side, about 400 ft. above the creek. The main line of the C. B. & Q. railroad passes along the bottom of this cañon. During former years supplies for the mill had been hauled by team from a railroad spur half a mile up the creek. The grade of this wagon road was steep and it was an expensive haul.

Finally Manager John Gray conceived the idea of building a skipway direct from the railroad tracks to the crest of the hill. The gage is 42 in., the rails weigh 45 lb. per yard and a 42-h.p. Hendrie & Blothoff electric hoist operates the skips. The heaviest load handled was a 5-ton section of a No. 6 Gates crusher. Teaming concerns asked $150 for hauling this piece from the railroad spur to the mill. The skipway did it for one-fifth of that amount. Now that the mill is running, the skipway is used to deliver supplies to the various parts of the mill.

*Deadwood, S. D.

Duty on Lead-Zinc Ores

WASHINGTON CORRESPONDENCE

The United States Court of Customs Appeals has rendered its decision in the case of the appeal of the Consolidated Kansas City Smelting and Refining Company, affirming the assessments made on ores imported. The appeal was taken from a decision of the Board of General Appraisers affirming the assessment of duty made by the collector at El Paso, Tex., upon merchandise imported at the port of El Paso, Tex. The merchandise in question consisted of a number of shipments of ore from Mexico, each shipment containing lead in large or small percentage, and each containing over 10 per cent. of zinc. All were assessed with duty on both the lead and the zinc contents, under paragraphs 181 and 193 of the act of 1909.

The importer claimed that it was improper to assess duty under both paragraphs, and that these ores were imported and smelted merely for the lead contents and should therefore be assessed with duty only under paragraph 181, the lead paragraph. The Board of General Appraisers overruled the importer's claim, and sustained the action of the collector.

INTENTION OF CONGRESS

It was contended by the appellant that the records of the tariff hearings show that the question was presented to Congress of specifically providing that where both lead and zinc appeared, the ore should pay duty on both the lead and zinc contained, and that as the proposed amendment was not adopted the inference should be drawn that Congress intended that the ore should not be taxed for both the lead and zinc content. The record of the tariff hearing shows that there was presented a proposed amendment to the law reading as follows:

"Lead-bearing ores of all kinds, 1½c. per lb. on lead contained therein; zinc-bearing ores of all kinds, 1½c. per lb. on the zinc contained therein.

"Provided. That all ores imported which contain both lead and zinc shall pay 1½c. per lb. on lead contained therein and also 1½c. per lb. on the zinc contained therein."

This proposed amendment was not adopted by Congress, but the language actually employed was that appearing in the sections referred to above. "We cannot regard this incident as controlling unless we shall find such ambiguity in the language employed as justifies resort to side lights," says the court. "Many reasons might have suggested themselves to the members of Congress why this particular language should not be employed, and among them is that it was thought best to exempt zinc-bearing ores entirely from duty where they contained less than 10 per cent. of zinc.

POSSIBLE RECOVERY OF THE METALS

"It is next contended that lead-bearing ores and zinc-bearing ores are distinctly different articles of commerce, and that where the lead ore is recovered the zinc is not, and where the zinc ore is recovered, the lead is not. To place a construction upon the statute which would confer upon the importer the privilege of determining for himself to which use he would put the ores bearing both lead and zinc is perhaps possible, but before such a construction should be adopted, we ought to be convinced that the intention of Congress vesting this privilege in the importer is made to appear clearly by the enactment."

In conclusion the court says: "It appears by the testimony taken that ores may be both zinc-bearing ores and lead-bearing ores, and that each of the metals may be recovered and the ore profitably manipulated for their recovery by the process of concentration and smelting the several ores by the appropriate method. This being the case, it is hardly conceivable that Congress intended that zinc-bearing ore which also contained lead might be dutiable only for the zinc or that lead-bearing ore which contained zinc might be dutiable only for the lead. A most significant feature of this act is that while the actual smelting of zinc ores is only practicable when there is present 35 per cent. of zinc content, section 193 in very clear terms makes all zinc-bearing ore containing 10 per centum subject to duty. It is very clear from this that it was within the contemplation of Congress that ores which required mechanical treatment to concentrate them in preparation for the retort used in reclaiming the zinc should be dutiable in their crude state. Indeed this language requires that all ores containing a greater quantity than 10 per centum of zinc must be treated as zinc ores and assessed under paragraph 193. As is pointed out by the Board of General Appraisers in their opinion, Congress has provided for a duty on the metal content of ores rather than on the recovered metal itself.

CONSTRUCTION OF THE ACT

"We think that section 24 of the act, which regulates smelting in bond, cannot be given a construction which would render unavailing an assessment on metal other than lead. The record in the case before us does not show that the importer proceeded under this section. All we have before us is the question of whether the liquidation of the collector upon the importation was correct, and we do not think that section 24 should be construed as modifying or abrogating the provisions of section 193, imposing a duty upon all zinc-bearing ores containing more than 10 per cent. of zinc.

"It is urged that the duty must be assessed on goods, wares and merchandise in the condition as imported. This is accepted. But it is the zinc content of these ores when imported that is in controversy here, and the zinc content, if in excess of 10 per cent., is dutiable under the express terms of section 193.

"The same consideration answers the suggestion that articles are not to be separated into their elements for the purpose of classification. There is no separation into elements of this ore. There is an ascertainment of the contents of the ore, and the duty is levied upon such contents. What happens to the ore thereafter is a matter of no concern to the collector and is not a matter which was considered by Congress in enacting the statute. This statement also answers the suggestion that chief use is controlling. It is enough to demonstrate that this ore is dutiable for the zinc content to show that it contains in excess of 10 per cent. of zinc when coupled with the fact that ordinarily ore containing both lead and zinc may be mechanically treated so as to make it commercially practicable to recover both the lead and the zinc."

Yellow Pine District, Nevada

Fred A. Hale, superintendent Yellow Pine Mining Company, Goodsprings, Nev., writes as follows: "The mill now under construction by the Yellow Pine company, will begin crushing within 30 days; it will have a capacity of 60 tons daily. The ore is a carbonate of zinc and lead, averaging about 30 per cent. zinc, 15 per cent. lead and 12 oz. silver. The object of the mill is to separate the lead from the zinc and to eliminate as much barren limestone from the zinc "tailings" as possible, but the gravities of the minerals being so near alike renders it almost impossible to get a clean separation of the zinc and limestone, and by far the greater part of the material passing through the mill will be shipped. The crushing is done by an 8x12-in. Blake crusher and two sets of 16x30-in. rolls. The roll products are screened by Colorado Impact screens, the two sizes being jigged in Harz jigs and the tailings returned to the rolls. The final product passes through a 20-mesh screen, and is classified in a six-compartment Overstrom classifier, the products from the classifier going to six Overstrom straight-line tables. Of special interest, is the fact that this is the first installation of the Overstrom system of classification and table work by graded sizes of feed, which has since been adopted in the designs of several other new mills in the Southwest.

"The Yellow Pine company is also constructing a 36-in. gage railroad from Jean to its mine, via. Goodsprings, a distance of 12 miles. The material is all on the ground, and the road should be completed by July 1. This railroad will also enable several other companies to work

their mines to better advantage, and will result in a marked increase in the shipments from the district.

"The Yellow Pine mine workings have reached a depth of 450 ft. on an inclination of 45 deg., and about 70,000 tons of high-grade ore have been blocked. The orebodies are remarkably regular, being a metasomatic replacement in a bed of Carboniferous limestone, near the contact of a large intrusion of rhyolite porphyry.

"The district is now shipping about 150 tons of lead-zinc ore per week, together with an occasional car of high-grade lead and copper ore. These shipments will probably be greatly increased in the next six months. Another railroad, projected for the west side of the mountains, will tap a rich mineral belt, and should result in several large producers."

Report on Transvaal Mining

JOHANNESBURG CORRESPONDENCE

The government mining engineer, in his report for the year ended June 30, 1910, presents a well arranged body of statistics, and the general conclusions he draws from them appear warranted by the facts. The two outstanding facts, as far as the mining industry of the Witswatersand is concerned, are the lower grade of the ore being treated and the increase in working costs. The first he attributes largely to the general tendency at any goldfield to mine increasing quantities of lower-grade ore as the field grows older. The second he attributes to attempts being made to work narrower stopes and mainly to an inadequate and inefficient labor supply. Mining operations are being conducted on an increased scale and the number of mines crushing over 50,000 tons per month has doubled as compared with 1909.

DECLINE IN WAGES

The average rate of wages paid has continued to fall, partly owing to the employment of more unskilled whites, but the number of whites employed and the gross earnings have increased. During the year ended June 30, 1909, whites employed during the first half of the year numbered 18,203, whose wages averaged £333 per man per annum; during the second half of that year 19,753 whites were employed, at an annual average wage of £329. For the year ended June 30, 1910, whites employed during the first half of the year numbered 21,497, earning an average wage of £327 per man per annum, while during the second half of that year 23,094 whites were employed, earning an average wage of £321.

EFFICIENCY OF LABOR

The efficiency of the labor shows a decrease per 1000 tons hoisted per day on the producing mines; in June, 1909, there were employed underground 102 whites and 1366 natives; in December, 1909, 111 whites and 1270 natives, while in June, 1910, there were 114 whites and 1430 natives employed underground for every 1000 tons hoisted.

On June 30, 1910, 9893 stamps and 182 tube mills were in operation. The average duty per 24 hours was 6.924 tons, an increase of 0.341 tons over 1909. For the year 1904 to 1905, 1.24 white and 9.7 native laborers were employed per 1000 tons milled; in the year 1908 to 1909, 0.88 whites and 8.10 natives, while for the year 1909 to 1910, 0.95 whites and 7.58 natives were employed. In the year 1904 to 1905, 801.9 tons of ore were milled per white employee and 103.1 tons per native; in the year 1908 to 1909, 1133.1 tons were milled per white employee and 123.5 tons per native; for the year 1909 to 1910, 1056.3 tons were milled per white employee and 131.9 tons per native. In West Australia the tonnage raised and treated per employee was 203.69 in 1908 and 193.98 in 1909, and value of gold per man £443.8 and £413.18, respectively. For 1908 and 1909 on the Rand, the figures were £166.95 and £166.27.

The ratio of colored labor to whites showed a decrease for the last year, as owing to the scarcity of native labor, much unskilled white labor has been employed. In the year 1907 to 1908, 9.3 natives; in the year 1908 to 1909, 8.9 natives; in the year 1909 to 1910, 7.7 natives were employed for each white laborer.

The total amount earned in salaries and wages in the gold mines of the Transvaal in 1910 was £12,395,494; of this, salaries absorbed £1,186,316, white wages were £6,385,164, colored wages, £4,792,357, and £60,000 for Chinese. The prevailing wages for 1910 were: for shift bosses, 24s. 7d.; timber men, 20s. 4d.; machine and stope contracts, 27s. 11d.; and 23s. 8d. for hand stopers' contracts.

Rio Tinto Company

The report of the Rio Tinto Company for the year ended Dec. 31, 1910, shows a gross income of £1,250,112, and expenses and losses of £232,127. The net earnings are distributed at the rate of 5 per cent. on the preference shares, and 50 per cent. on the common shares, leaving a balance of £26,980 undivided profits.

The ores mined amounted to 2,146,765 tons, of which 637,020 tons were for direct shipment, and 1,509,745 tons for local treatment. During the year there were produced by treatment at the mines 22,790 tons of copper, and in the pyrites shipped there were 10,633 tons of copper. Deliveries of sulphur ore to customers amounted to 683,605 tons, and of cupreous ore, 578,443 tons. Since 1876 the Rio Tinto Company has extracted 16,569,238 tons of pyrites for shipment and 33,190,235 tons for local treatment, and has produced 599,152 tons of copper at the mines. The copper production has been exceedingly regular since 1891, reaching a maximum of 24,364 tons in 1909, and a minimum in 1905 of 19,530 tons.

Operations at Valdez, Alaska

SPECIAL CORRESPONDENCE

The Alaska Gold Creek Mining Company, operating on Gold creek, five miles west of Valdez, has completed financial arrangements for the installation of a mill to work the property. E. D. Westbrook is president and manager.

The Beaver Dam Mining and Milling Company, operating near the Government military trail, at Beaver Dam, has recently extracted some rich ore from tunnel No. 2, which is now 180 ft. long. This property was bought for $40,000.

The Shoup Glacier Mining Company has acquired a group of claims located by William Palmer and C. B. Smith, west of Valdez about 10 miles, and close to the Shoup glacier. The company has let a contract for 100 ft. of tunnel.

Malcolm McDonald and William Brady report the discovery of quartz veins near Columbia glacier, about 35 miles west of Valdez. This indicates the continuation of the gold belt along the coast country as far west as Seward, 100 miles from Valdez.

C. W. Harrington reports that the Valdez-Liscum property at Shoup bay has disclosed free gold. The discovery is considered of importance, as strengthening the possibilities of the properties on the east side of Valdez bay.

Perry Drau and Lon Morgan report the discovery of an 18-in. quartz vein on Mineral creek, above Fox cañon. The vein is traceable for a long distance and shows free gold. Numerous locations have been made and work on a tunnel started.

The Trinity Gold Mining Company, organized in March with H. E. Ellis, president, and Charles G. Ganty, secretary, capital, $500,000, has acquired the Mark Gleason property south of the mouth of Mineral creek. The price is reported $100,000. Claims are on parallel veins and high assays are reported. A delegation of New York stockholders will visit the property this summer.

It is reported that the Valdez Bonanza mine, on Mineral creek, has cut its oreshoot showing free gold in the lower tunnel at 110 ft., and that this property will soon be in position to mill its ores.

The Comet claims, on the south side of Mineral gulch, have been leased to a Seattle company represented by O. G. Ganty. British Columbia operators have acquired the Crawford-Tuttle property, between the Cliff and Black Diamond properties on Valdez bay.

Outlook for Mining Legislation

WASHINGTON CORRESPONDENCE

In connection with the investigation of the various administrative departments which is being planned by the committees of the Democratic House of Representatives, it is expected that some attention will be paid to the Geological Survey incidental to the general situation in the Department of the Interior. One side of the inquiry seems likely to be an unmixed good inasmuch as it is to be expected to deal with conditions in public buildings that endanger the lives of employees and the safety of Government records and property. The Survey has been badly and inadequately housed for a long time and appeals to Congress have not produced any relief, and the records and property are still exposed to danger.

The Democrats have practically decided against any tampering with the metal schedules at this session of Congress. It is now stated that whatever is done in that direction will probably be attempted next winter, but that there is less disposition to reduce the rates on metals than on most other articles, owing to the fact that the Republicans made a reduction in some lines during the Payne-Aldrich tariff controversy. This puts the metal question aside for the present unless the question of lead and zinc should be dealt with incidentally in connection with the subject of smelting in bond, a subject Treasury Department officials are somewhat disposed to urge reopening owing to the unsatisfactory character of the present law on that subject. The apparent immunity of the metal schedules from any attack for the present is leading to sharp criticism from other interests which are dissatisfied with the effort to reduce their own rates of duty. It is expected that this may produce considerable political recrimination, and some members of Congress predict a debate on the metal schedules upon the floor due to a desire to drive Democratic leaders to an admission of their partiality for those rates of duty.

Considerable chagrin has been expressed here by Government officials because of the failure of mine-rescue methods to work entirely satisfactorily in recent mine disasters. The accidents lately announced have led to a revival of the demand for more powers for the Bureau of Mines and for Federal legislation designed to protect workmen's lives in mining operations. There seems, however, to be little chance of any immediate action. Speaking of the question of mine-rescue apparatus, Doctor Holmes, of the Bureau of Mines, who has recently returned from investigating the accidents at Banner, Ala., and Throop, Penn., says that "no operator should feel satisfied until every precaution known to the industry has been taken. Doctor Holmes thinks that mine fires like those referred to could easily be extinguished if promptly attended to, and urges that the shafts, stables and engine rooms, when underground, should be of fireproof construction. If combustible materials must be stored in the mines there should be ample water supply and fire-fighting apparatus. Only explosives least likely to ignite either gas or dust should be used and there should be a general system of electric firing to be used at a time when all of the miners are out of the mine. Under no conditions should the powder and detonators be carried into the mine together or kept in the mine over night. A thorough wetting of bituminous mines is necessary, Doctor Holmes thinks, and that the most satisfactory manner of securing it is to turn the exhaust steam from the mine power plant into the mine along with the air current."

Old Dominion Company

The Old Dominion Company is a holding company only, owning 155,245 shares out of 162,000 issued of the Old Dominion Copper Mining and Smelting Company, and 23,000 (the entire issue) of the United Globe Mines. For the year ended Dec. 31, 1910, the Old Dominion Company paid 6 per cent. on its issued stock (293,245 shares at $25 par) and ended the year with a total surplus of $115,948, of which $44,641 was due to 1910 operations.

The Old Dominion Copper Mining and Smelting Company reports a cost per ton of ore of $8.677 for 1910, divided as follows: Mining, $5.171; concentrating, $0.405; smelting and converting, $3.101. The corresponding figures for 1909 were: $5.08; $0.408; $3.332; a total of $8.82. The average smelting ore mined carried 7.85 per cent. copper and the concentrating ore, 3.49 per cent., there being 119,110 and 86,060 tons of the respective grades. Concentration costs per ton of ore concentrated were $0.975, and smelting costs per ton of new charge were $2.926. The cost of converting per pound of fine copper was $0.00484.

On the twelfth level there was completed an installation of Nordberg corliss engines driving duplex pumps, the total capacity being 6,000,000 gal. per day. On the fourteenth and sixteenth levels are three electric-driven triplex pumps, with a total capacity of 3,240,000 gal. per day. The water during the year has been less than formerly, varying from 3,000,000 gal. in January, 1910, to 2,560,000 in July, and thence up to 3,816,000 in December. Tests showed that the water from the lowest end of the mine was pure, so that one of the twelfth-level pumps supplied water for the company's supply. Water was also furnished the city of Globe during the summer months, and the Miami company has contracted for 1,000,000 gal. per day.

Production for the year from Old Dominion ores was 17,712,755 lb. fine copper; 36,743 oz. silver, and 488 oz. gold. From custom ores 10,028,577 lb. fine copper; 109,658 oz. silver, and 1636 oz. gold in 28,018,900 lb. of blister copper. Production for 1911 should be about the same. The ore seems to be changing from oxide to sulphide, which will simplify the metallurgical problems.

United Globe Mines development was done through the Old Dominion mines in 1910, 5872 ft. of work being thus performed. About 26,000 tons of low-grade silicious ores were shipped to the Copper Queen smeltery for converter lining, beside various smaller lots of high-grade ore. Developments are considered satisfactory. The Old Dominion Copper Mining and Smelting Company paid dividends of 12 per cent. in 1910 (par $25) and carries forward a surplus of $2,050,125; the United Globe has paid no dividends since 1907 and carries forward a surplus of $854,256 on $2,300,000 outstanding stock.

Iron and Steel in France

The iron and steel trade in France seems to have been prosperous in 1910, production reaching a high level. The official statement of the production of pig iron, compared with 1909, is as follows, in metric tons:

	1909	1910	Changes	
Foundry iron	706,881	760,622	I.	53,741
Forge iron	504,524	556,767	I.	52,243
Bessemer pig	115,097	104,966	D.	10,131
Basic pig	2,196,273	2,549,908	I.	353,635
Spiegel and ferro	51,073	60,196	I.	9,123
Total	3,573,848	4,032,459	I.	458,611

The production in 1910 was the largest ever reported, exceeding by over 400,000 tons that of 1907, previously the year of greatest production. Imports were, in round figures, 237,000 tons and exports 116,000, leaving for consumption approximately 4,154,000 tons, or 544,000 tons more than in the previous year.

The production of steel also reached a high point in 1910, the figures being as follows, in metric tons:

	1909	1910	Changes	
Acid converter	103,238	112,738	I.	9,500
Basic converter	1,852,233	2,172,806	I.	320,573
Open-hearth	1,059,235	1,185,615	I.	126,380
Crucible & electric	24,340	35,338	I.	10,998
Total	3,039,046	3,506,497	I.	467,451

The largest increase shown was in basic converter steel, which was 60.9 per cent. of the total in 1909, and 62 in 1910. Like that of pig iron, the steel production was the largest ever reported.

For the preparation of Thomas converter bottoms a mixture of crushed dolomite with 4 to 5 per cent. of tar is proposed in French Pat. 418,449, July 19, 1910. The bottoms are then gradually heated to a temperature of 300 to 400 deg. C. before use.

Blowing In Silver-Lead Furnaces

By L. B. Harrison *

A method of blowing in silver-lead furnaces which combines the advantages of the melted-lead and platform methods of blowing in. Lead bars are stacked in the crucible to make a platform and no molten lead is introduced.

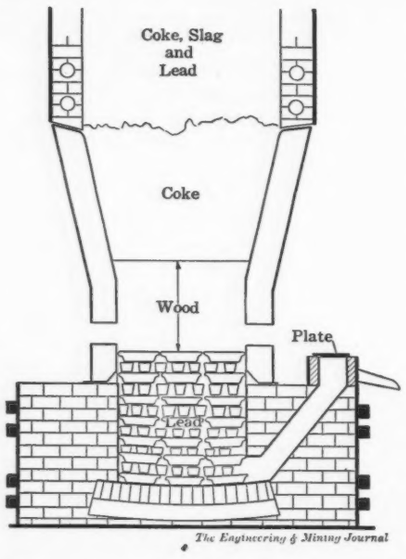
*Apartado 1839, Mexico, D. F.

While the blowing in of silver-lead blast furnaces is usually a simple routine affair, many crucible troubles can be traced to a poor start, and at many plants it is frequently a long, expensive proceeding. The following method of blowing in a silver-lead furnace practised at Mapimi may, therefore, be of interest to those superintendents who are using either the "platform method" or that in which lead is first melted in the crucible preparatory to filling the furnace. I do not claim to have originated the method, for it may be in use at many plants in the United States, but, as far as I know, I first employed it at the Mapimi smeltery, where it has proved so satisfactory, expeditious and economical that it has displaced the other methods and has been exclusively used for the last 2½ years. Before taking up the Mapimi method let us review advantages and disadvantages of the "lead-melting" and "platform" methods.

Lead-melting Method

In the lead-melting method it is usually considered necessary to heat the crucible thoroughly, and this is generally done with a coke or wood fire, introducing blast through pieces of iron pipe connected by canvas tuyere sacking to a convenient tuyere or blast main. When the crucible is thoroughly heated, usually requiring about 12 to 18 hours, this first fire is cleaned out and the clinkers that generally form when coke is used are carefully removed. A new fire is started and, when glowing, the lead bars are charged by means of a paddle until the crucible is full of molten lead. The fire is then raked out, being careful to leave no glowing coals that would ignite the wood that is to follow before the furnace is full, and the front and back breasts quickly bricked up. From the feed floor wood is now thrown in, followed by the regular blowing-in charge of coke and slag, the wood being ignited and the blast turned on when the furnace is about full.

Besides the expense of the coke, wood and labor for heating the crucible and melting the lead there is danger of a loss by volatilization of the lead, and care must be taken that the wood, charged directly on the molten lead, does not burn before the blast is ready to be turned on the furnace. In the hurry to fill the furnace, and get the blast on before this wood can burn, careful work in the distribution of the blowing in charge is prevented. Moreover, part of the wood may be pressed down into the bath of lead by the weight of the charge above it and there, deprived of oxygen for combustion, it carbonizes and later results in crucible banks, as happens in the "platform" method. The time consumed in the drying, melting and charging may also enter as a factor, as from 24 to 36 hours are required to get the furnace in blast.



Blowing in; Platform of Lead Bars

The Platform Method

The "platform" has even greater disadvantages than the lead-melting method, though it presents the advantage of being able to fill the furnace in a more careful manner, as the charge may be ignited and the blast turned on whenever it is desired to do so. In this method a rough platform is built over the crucible of 1½x3-in. lumber that has been well soaked in water, leaving between the planks a space of about 1½ in., through which the lead is later to find its way into the crucible below.

On this platform, as shown in the accompanying illustration, is placed the wood for igniting the coke, taking care to place in front of each tuyere some finely split wood kindling which may be readily lighted. Directly on top of this wood, which will occupy from three to five feet in hight of the jacket space, the first round of coke is charged and above this coke there is charged the lead in the shape of bars necessary to fill the crucible, either all at once or sandwiched in between the succeeding coke and slag charges, after which the regular blowing-in charge is continued. When the furnace is full and it is desired to start, the wood is ignited by means of a little burning oil-soaked waste pushed in through the tuyeres and the blast turned on. The coke, being ignited by the wood, melts the lead which trickles down through the platform and fills the crucible. The slag is supposed to form after the lead has melted and filled the crucible and when it appears at the tuyeres it is tapped out and the furnace is in blast.

For a 46x162-in. furnace about 35 tons of bullion is required to fill the crucible, and this weight just above the coke and wood necessitates a platform of solid construction, not only to support this weight and the weight of the blowing-in charge, but to withstand the heavy settlings that occur, as the wood in burning leaves the space it occupied to be filled by the descent of the charge above it. Should the platform be too light to withstand these settlings it will be crushed and the crucible filled with wood, coke and slag, necessitating the cleaning out of the furnace and its refilling. At one plant the platform was supported by heavy stulls extending down to the crucible bottom in order to prevent the platform being crushed down, and these same stulls, together with parts of the platform, were found, carbonized but in their original position and surrounded by a hard coppery speiss, after a six months' campaign of the furnace. The furnace had long previous refused to make its lead through the siphon and all attempts at cutting through from the breast had failed.

Platform Produces Crucible Banks

Again, care must be taken that the platform be placed well above the slag tap hole and yet not too near the tuyere level, for if it be below the slag tap hole it will be submerged in slag and matte and there, being out of the reach of the blast, cannot burn. On the other hand, should it be built too near the tuyere level it is liable to be burned or weakened before the lead has melted and filled the crucible and allow the charge to get down into the crucible. Once the charge is down in the crucible the chances of its rising to the combustion zone are slim, for while wood, coke or charge will float on a bath of lead they would, under the circumstances, be pre-

vented from doing so by the coke and unfused charge that at all times fill the jacket space. The heavy settlings require, also, that the jackets be well braced, a fact brought forcibly to my attention in a plant where, of four furnaces blown in with platforms, the first two started had their jackets so displaced by the settlings of the charge that they had to be cleaned out and started a few days later, while the other two furnaces were barely saved by hurriedly bracing the jackets.

In fact, of all the furnaces that I have seen blown in with platforms there was not one that did not, after a week or so, develop crucible banks and crusts that prevented the furnace making its lead through the lead well in the regular manner, or whose crucible did not have to be blasted out after its campaign. Of the two methods the lead-melting method of blowing in is, in my opinion, far superior to the platform method, but it was to overcome the disadvantages of both of these methods, and at the same time to preserve the advantage of being able to fill the furnace carefully and insure the crucible being full of lead before slag was made, that the following method was devised.

Mapimi Method

About the time the furnace is ready, as far as the mechanics are concerned, a light fire of pine or mesquite wood is built in the crucible to dry out the moisture that usually accumulates when a furnace has been down and jackets and water connections changed. This usually requires from four to eight hours, when the fire is allowed to die out and the crucible to cool. When cool enough to enter, the ashes are swept out and a platform of lead bars is built from the bottom of the crucible to within three or four inches of the tuyeres by piling the bars in the same manner that they are piled for shipment but spacing them about one inch apart, as shown in the accompanying illustration.

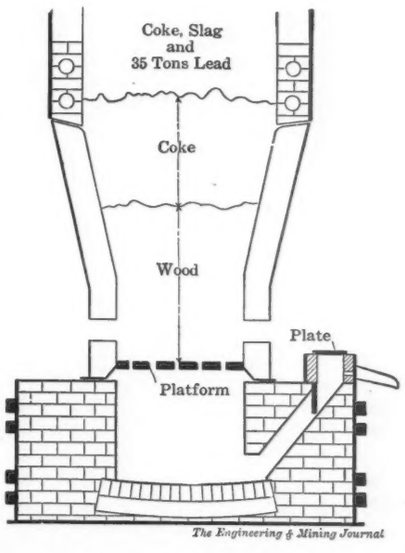
As the crucibles, 46x162 in., hold when new about 650 bars of 50 kg. each, about 550 bars are used in building the platform, but should the crucible be an old one or smaller fewer bars would, of course, be used.

On top of this platform of lead, in front of each tuyere, is placed some split pine wood together with a handful of oil-soaked waste. The back breast (the end jacket extends down to within 12 or 14 in. of the crucible top) through which the lead, etc., has been passed, is now bricked up, the front breast and tap jacket being already in place. From the feed floor some split ties, boards or mesquite wood are thrown into the furnace till there is a layer about three feet thick on the lead platform.

There is then charged about 16 to 18 barrows of coke, each holding about 85 to 90 kg. The regular blowing-in charge is now fed in, the remaining bars of lead to the number deemed necessary to fill the crucible, which were not used in building the platform, being charged with the second or third round of the blowing-in charge; the lead will melt and run down to the crucible before slag is melted. On the blowing-in charge raw matte is used, placing it at such a hight that it melts well after the slag, as it tends to wash out the furnace and, by its cutting effect, keep the tap hole open.

Starting the Furnace

The furnace being nearly full and ready for the blast, the waste is ignited by means of a little hot slag on the end of a bar poked through the tuyere and a gentle blast turned on till coke appears at the tuyeres, when the blast is increased. At the end of about two hours slag will show at the tuyeres, when the furnace may be tapped. While the small



Blowing in; Platform Method

amount of lead in the shaft and the small quantity of wood used cause no heavy settlings, they would be resisted by the unyielding lead platform and the charge prevented from getting down into the crucible. The lead is where it should be, in the crucible, that placed in the shaft having trickled down the spaces between hot coke and filled the spaces between the bars in the crucible, helping with its heat to melt them.

The crucible is full of lead that is rapidly becoming red hot from the heat of the lead from above and that of the burning coke, while the brickwork of the crucible is getting a gradual warming up, for it is usually about eight hours before the lead reaches a red heat. A plate should be placed over the lead well, luted with clay and held down by a weight, before the furnace is started, to prevent the egress of the irritating wood smoke, and it is usually the case that this plate may be removed about 1½ hours after the blast is first applied, and the siphon will be found to be partly filled with cold lead. At first it was our custom to drive red-hot bars down through this cold lead, about three hours after the furnace had been started, to start a flow of hot lead from the crucible up through the siphon, but we found that by leaving things alone it invariably opened itself in from six to eight hours, after which the lead may be tapped, and after one or two tappings will be found to be red hot.

No Particular Care in Starting

No further precautions are taken in blowing-in other than putting on an easy, low-lime slag, should the slag being run on the other furnaces be a difficult one, and the use of an extra 85 kg. of coke to every four 700-kg. charges for 10 to 12 hours, together with the usual one of giving the jackets plenty of water. Crucible crusts at Mapimi are almost unknown, in spite of a 2½ to 4 per cent. speiss fall (the total matte and speiss fall being usually from 6 to 9 per cent. and the ores arsenical), with, at times, a low percentage of lead on the charge; in fact, for the last two years no cutting through the crucible from the breast has been necessary, the lead in the well rising and falling freely with the blast and so hot that water has to be kept on the tap hole, for the lead at Mapimi is tapped at regular intervals into lead pitchers which are run to the dross plant.

It is interesting to note that in starting with a low blast, obtained by slightly opening the large gate admitting air from the main blast pipe to the bustle pipe of the furnace, more air is forced into one arm of the bustle pipe than to the other. This can be plainly seen by the brighter tuyeres at one side and a back pressure at the tuyeres of the other side, and it should be corrected by partly closing the individual tuyere valves on the side getting the most wind, thereby throwing more to the other side. This seems to be due to the fact that the blast, under a pressure of 44 oz. or more in the main blast line, shoots through the small opening in the blast gate in the direction of the nearest arm of the bustle pipe raising the pressure, or increasing the amount of air, in that arm. This disappears when the gate is wide open and the furnace taking full blast. It may be mentioned that at Mapimi each of the 16 tuyeres on the furnaces has its individual lever valve, an arrangement permitting quick and easy shutdowns, and far superior to the old arrangement where tuyeres pipes had to be loosened, then pulled in unison, and adobe cakes, or sheet-iron caps that were never to be found, put over the smoking tuyeres.

The complete blowing-in charge as used at Mapimi follows: (1), 18 barrows coke; (2), 8 barrows coke, 4 bug-

gies slag, 100 bars lead; (3), 8 barrows coke, 4 buggies slag; (4), (5) and (6), 8 coke, 4 slag; (7) and (8), 8 barrows coke, 8 buggies slag, 1 barrow raw matte; (9), (10) and (11), 6 barrows coke, 4 buggies slag, 2 ore charges; follow with regular ore charges, using raw matte, and with one extra barrow of coke, say 85 kg., to every four charges for 10 to 12 hours. A barrow of coke weighs about 85 to 90 kg.; a buggy of slag weighs about 830 kg. The fuel on the blowing-in charge, as given above, figures out about 15 per cent., a reasonable figure considering that the lead is put in cold and the furnace shaft, etc., absorb a good deal of heat.

Award in Silver King Suit

SALT LAKE CORRESPONDENCE

A decision was rendered at Salt Lake City April 10 by Judge John A. Marshall, of the U. S. circuit court in the case of the Silver King Consolidated vs. the Silver King Coalition Mines Company, involving an accounting for ore taken from the Vesuvius claim at Park City owned jointly by the two companies. The amount awarded the plaintiff for its share in this ore is $516,264 with interest at 8 per cent. per annum since Jan. 1, 1906. The judgment with interest amounts to $734,242.

The suit was begun in May 1908 by the Silver King Consolidated, which sought an accounting of the net profits to the defendant from working the jointly owned property. After an interlocutory decree for the accounting the plaintiff amended its bill so as to claim one-half the total proceeds, alleging as a reason why no allowance for cost of extraction should be made, that the defendant had extracted the ore secretly, in bad faith and without any intent to account and pay over to the plaintiff its just proportion of the net profits. It appears without dispute that the Silver King Coalition by means of a deep shaft and workings through its own claims penetrated the Vesuvius claim, and extracted a large amount of ore from it; that it treated this ore as its exclusive property, mingling it with ore taken from stopes owned by it alone; kept no separate account of the value and quantity of ore taken, and at the time of the suit had no means of definitely ascertaining the same, having to rely on the memory of witnesses and the opinion of experts. The plaintiff was ignorant of the taking of the ore while it was in progress.

MEASURING THE STOPE

Judge Marshall in his decision states that to determine the quantity and value of the ore taken is difficult, and an attempt now to separate the profit is at best attended with uncertainty. The defendant deliberately intended to obscure the question, where accuracy was readily obtainable, and it can only be assumed that it was thought the exact facts would be more unfavorable to the defendant than any conclusions that could be arrived at by such evidence.

In determining the quantity of ore taken the size of the excavated stope was, of course, necessary, but before the plaintiff knew of the taking of the ore the stope had, in a large measure, caved. There had been no accurate survey of the cavity from which its dimensions could be even approximately determined. Judge Marshall finds the extent of the excavation to be 573,937 cu.ft., with waste and caved material amounting to 435,350 cu.ft. There had been removed 31,551 cu.ft. in an attempt to clean the stope since the suit commenced. An expansion amounting to 100 per cent. was allowed for the waste with the timbering, compared to the rock in place, so that the volume originally occupied by the latter was 233,450 cu.ft., leaving 340,487 cu.ft. which was removed as ore. This was divided into first and second class.

CLASSIFICATION OF THE ORE

It was impossible to make a division into first- and second-class ore based on the evidence, so that nothing was left but to conclude that the volume was one-half first- and one-half second-class ore. For the first-class ore 9 cu.ft. were allowed to the ton, and for the second-class 12 cu.ft. This gave 18,916 tons of first-class, and 14,187 tons of second-class ore extracted.

The court states there was a great want of certainty with respect to the value of this ore. The defendant claimed that a value ought to be assumed equal to the average value of the ore sold by it from this and adjoining claims, during the period that ore was mined from this stope (approximately from 1902 to 1908). The price of the metals changed from day to day, and there was no reliable evidence as to when the ores from the Parson's stope were marketed. It would have been an easy matter to have kept these ores separate. Under these circumstances, Judge Marshall considers that the defendant must be held for the highest monthly average price received by it for ores during the period of the taking. This price as to first class ore was $60.07 per ton. The total received for first-class ore then amounted to $1,136,284. The cost of mining, tramming and sampling the ore amounted to $6.33 per ton, or a total cost of $119,738, leaving a net value of $1,016,545.

As to the second-class ore the highest net value, as shown by the defendant was $3.53 per ton, and the total net value was therefore $50,080. The defendant was allowed a further credit of $34,097 for the cost of development work confined entirely to the Vesuvius claim, and which was necessary to the extraction of this ore. The result is that the net total amounts to $1,032,528, one-half of which, or $516,264 is due to the Silver King Consolidated. To this to be added simple interest at 8 per cent. per annum from Jan. 1, 1906, making a total of $734,242.

The judgment is one of the largest ever awarded in a case of the kind. The decision involves a number of points of law, which makes the case a leading one on the mining of ore in claims owned by cotenants. There is some talk that the case will be appealed. The decision is favorably regarded in Salt Lake City.

Great Northern Iron Ore

The trustees who hold what are known as the Great Northern or Hill iron lands in the northern part of the Mesabi range in Minnesota, make the following report for the calendar year 1910:

Dividends (royalties) received	$2,105,000
Interest, etc	6,479
Total receipts	$2,111,479
Expenses of trustees	$67,627
Dividends paid	2,250,000
Total payments	$2,317,627
Deficit for the year	$206,148
Surplus from 1909	238,979
Surplus, Jan. 1, 1911	$32,831

Referring to the operation of the ore properties, particularly those of the United States Steel Corporation, whose mining company for the Hill properties is known as the Great Western Mining Company, the report says: "During the year 1910, the shipments of ore from the properties of the companies in which the trust is interested amounted to 5,470,270 tons, as against 3,016,619 tons in 1909. From the notices received from the Great Western Mining Company and other lessees of their contemplated operations during the year 1911 it is expected that the ore shipments will be increased the coming season. The work of exploration and development called for by the lease of the Great Western Mining Company has continued to be prosecuted during the year 1910, with the result of putting the properties in such condition that shipments therefrom can be made to the full extent provided by the terms of the leases.

"In January, 1911, the Great Western Mining Company paid the minimum royalty called for by the lease for the year 1910. The amount of this royalty stands as a credit against future shipments to be made by the Great Western Mining Company and can only be distributed to the various companies whose stocks are held in trust by the trustees when their respective proportions thereof shall have been ascertained by the results of actual mining. The trustees, acting as agents for said companies, have received the amount thereof and will distribute it to the companies entitled thereto as soon as the amount apportionable to each can be determined. In the meantime these funds will be placed at interest."

Present Status of Porcupine District

Special Correspondence

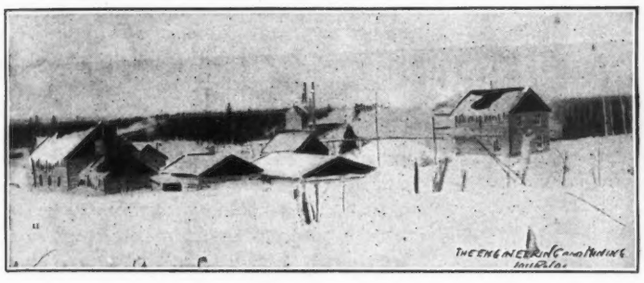
Porcupine is rapidly coming into prominence. It is only a comparatively short time since the first rumors of the new Canadian gold district were heard. Today, the boom is on and the mails are carrying the familiar market letters, special bulletins and the well known run of "literature" regarding the new flotations. It is always at this stage of any fresh mining excitement that the unwary are caught—the suckers hooked. A few remarks regarding the actual state of affairs at the present time, may, therefore, be apropos; and it is with the hope that those who are prone to leap before they look will be led to reverse the order, that the following facts are presented.

Payments for claims in this Ontario goldfield are made in instalments but with such short intervals that little prospecting work can be accomplished before all the payments have been made.

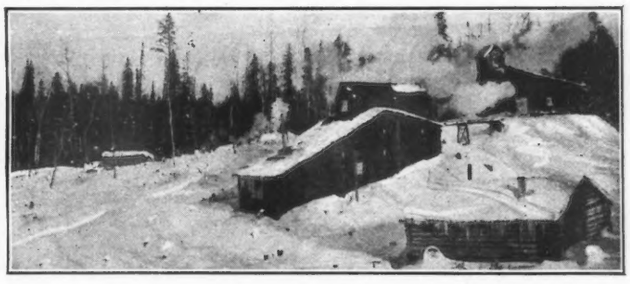
Promptness of Geological Survey

It is unusual that, notwithstanding the fact that the camp is only a trifle over a year old, an authorized geological survey has already been made and the results made public some time since. Such surveys, on this side of the line at least, are usually made several years after the district in question has started to produce. For this very reason the survey did little more than aid the prospector in a general way. This was not the fault of the survey; on the contrary, it was the express purpose for which the survey was made. The results obtained did not settle the geology of the district and it was impossible that they could do so. The reason for this is the lack of outcrops in the district and the scant amount of development work that had been accomplished at the time the survey was in progress.

No correlation or minute details will be attempted here. Suffice it to say that there is a great quantity of Keewatin schist, some Laurentian granite and Huronian conglomerate; quartz, both vitreous and milky, ferrodolomite and iron pyrites. The gold occurs in the milky quartz and in the Keewatin schist where the schist is found separating parallel stringers and veins of the gold-bearing quartz. Further, there appears to be a close relation between the iron pyrites and the gold; so much so, that the pyrites is now considered to be a fair indication of the presence of the gold. The gold itself occurs free in the quartz, in particles varying in size from invisible to large slugs or nuggets.



The Hollinger Mine



The Vipond Mine

Golden City—Porcupine District

Dome Boiler on Porcupine Lake

Variations in Occurrence of Gold

The country has experienced considerable glaciation and in a great many places shows marked faulting. On account of the faulting and also because the formation is one of the oldest known geologically, a great lack of continuity of the veins is found as was to be expected. This has resulted in a wide distribution of quartz and in a correspondingly apparent wide distribution of gold. Of course, the distribution of the gold may be as great as it appears to be at present; only future development work can prove it. The immediate effect is to stimulate prospecting. Now undoubtedly the more prospecting that is done, the greater will be the number of quartz veins uncovered. The question of the extent of the mineralization enters here. Development work to date, and the frequent announcements of fresh finds, indicate that the surface showing, at least, is distributed over a large area. How it holds with depth is observable in only a few cases.

It is not uncommon to see a series of narrow, parallel stringers of quartz, each a few inches wide and separated from each other by the Keewatin schist. The total width of the area so covered may be 50 ft. or more. One or more of the stringers may be rich in free gold and the intervening schist will probably assay $2 to $4 per ton. On such a showing, at a comparatively shallow depth, the stringers have come together, forming a well defined quartz vein about 8 ft. wide and containing good pay ore. In other cases, a narrow stringer, rich in free gold on surface has widened with depth, but the gold contents have decreased or run out altogether. Again, a 4-ft. vein of quartz, assaying only $2 to $5 on surface has increased in width with depth, and the gold

content is materially greater. So it is evident that there is a great variety of conditions under which the gold may be expected to occur.

Proved Properties

The properties best known in the camp today are the Dome, the Hollinger, the Vipond and the Rea Consolidated. These alone can, in any sense be regarded as even approaching the stage known as a proved property. To consider them in this class is possibly stretching the meaning of the term. It should be distinctly borne in mind that such properties as the Preston East Dome, the Dome Extension and most, if not all, of those having the word "Porcupine" prefixed to the name, are nothing more than prospects. Most of them have a showing of some sort but it remains to be proved whether the gold persists in depth, whether the vein widens to such an extent as to permit profitable mining, whether the orebody is so located on the property that a deposit of mineable extent is present and other points, too often not considered at all, by the average person who buys stock in a gold mine. It is such points as these that the average buyer of stock in these companies furnishes the money either to prove or disprove. In addition to this, the money first paid to such companies and a goodly portion of each subsequent payment, helps defray the original cost of the claim or makes payments on the property, as stipulated in the terms of the contract by which the property is held. These prices are not low—quite the contrary. I could give here a long list of properties in the district and the terms under which they could be optioned or purchased. There is nothing to be gained, however, by so doing. It is enough to say that the initial payments run well into the thousands, the subsequent payments are even larger and the time between them is about 30 days. In other words, a great quantity of money goes immediately into the pockets of the claim owners when it should go into the development of the property.

How Claims May be Acquired

For one who visits the camp with a view of selecting one or more claims for the purpose of exploring them, the following deductions may be useful, when it is recalled that the country for 15 miles or so around Porcupine is staked out in claims of 40 acres each. The problem is by no means simple, especially if time is somewhat limited. When this is realized, it becomes necessary to differentiate between the propositions which are encountered on every hand. Claims are being held at a high price, if they are close to a gold-bearing vein, regardless of the showing on the property itself. There are, then, five things that a prospective investor in claims can do, depending upon his resources and upon what sort of a campaign it is desired to follow. The propositions can be readily places in one of these five classes. This materially reduces the difficulty of making a selection and saves a large amount of time, when it is remembered that there are upward of 10,000 claims, any one of which may be obtained if the terms can be agreed upon. It is possible then: (1) To purchase a mine. (2) To option, for a large sum, a prospect having a spectacular showing of free gold. (3) To option, for a large sum, a supposedly well situated property, having no showing or outcrop. (4) To buy a number of cheap claims, scattered promiscuously throughout the district, on which there is no showing or outcrop. (5) To option, for a small sum, a property having a fair showing, and upon which conditions are such that better values may be expected at depth.

Which Kind of Property?

The properties of the first class are the Hollinger, Dome, Rea Consolidated and a few others of like caliber. It is useless to consider these because to purchase such a property, besides consuming a fortune at the start, would merely put into the seller's pocket the profit that the buyer really expects but will not get. In short, the speculative element is largely eliminated.

It is not wise to invest in the second class, because, as a rule, the time allowed for exploration work is so short that little of value can be accomplished. The spectacular showings usually occur in small stringers and unless they unite at depth to form a vein 4 ft. wide, it is difficult, if not impossible, to mine at a profit.

If properties in the third class are optioned for a large sum, and it is always a large sum that is asked, it is absolutely like buying a pig in a poke, if no rock is visible at surface. Again, a vein found on one property, can not, with any degree of certainty, be expected to line up on the adjoining property, as it does on a piece of paper. This is due to the lack of continuity of the veins.

There are countless claims to be had for $200 each, which is a nominal price in the camp. The only way in which buying such claims would run a fair chance of being profitable, would be to purchase a large number well distributed over the district. As a rule, only one year's assessment work has been done on claims of this class. At the end of the first year, therefore, it would require quite a sum of money to do assessment work required by the Ontario Mining Act, in order to hold the claims. The only chance would be that one or more of the claims had increased in value by reason of development on nearby properties.

The last division, it would seem, contains the best proposition, all things considered, for the average investor. Provided that it be possible to obtain, for a small cash payment, the option to explore for a reasonable period of time and with privilege of extension, the most favorable opportunity offered is a claim showing a 5-ft. vein of mineralized milk-white quartz, situated on the property in such a manner that the orebody of mineable extent is present should commercial ore be found at depth. After several weeks have been spent in the camp, the number of properties found to belong in this class is astonishingly small.

Labor, Power and Supplies

Labor in the camp is fairly plentiful and of a reasonably good grade. Wages for day labor, such as is necessary in trenching, test-pitting, etc., ranges from $2 to $3.50 per day. If the men are fed at a company boarding house, 60c. per meal is the amount usually charged. In general, Norwegian labor seems to be preferred. Cook's wages run from $60 to $65 per month, and blacksmiths earn $3 per day and board.

The mines and mills will be furnished with ample electric power from a plant which is now being installed at the Sandy falls of the Mattagami river, about 12 miles from Porcupine. It is expected that power will be ready for delivery by June 1, 1911. The distance necessary to transmit the power is short, and by the use of such power it will be possible to reduce mining costs materially. Supplies, such as groceries, hardware and the like are plentiful, and are furnished by large Canadian firms that have branch agencies in Porcupine. The prices are more reasonable than would ordinarily be expected under the circumstances. For small quantities, it is cheaper to buy in Porcupine than to attempt to purchase outside and haul the stuff in.

The Ontario government is now extending the Temiskaming & Northern Ontario Railway from Kelso to Porcupine and at present the rails are laid about 6 miles out of Kelso. The condition of the roads makes it impossible to transport heavy freight in the summer. It is expected that the railway will reach the camp by July or August, 1911.

In the above remarks, I have not intended to detract in any way from what appears to be a bright outlook for the camp. It is not unsafe to say that there have been no unfavorable developments to date. The worst handicap the camp possesses is the uniformly exorbitant prices that are asked for the privilege of a reasonable working option. What I have tried to emphasize is the undeniably prospective stage that the camp is now in. At the present time there is nothing in the camp which can be considered an investment. A few properties are attractive speculations; the balance are gambles pure and simple. With the near advent of the railroad, there is every in-

dication that the district will, during the coming summer of 1911, undergo a boom not unlike and possibly even more far reaching than that which possessed the Cobalt camp in its early days. Ontario has, indeed, furnished the mining world with all the excitement to be desired during the last six years.

Cornwall Mining Notes

LONDON CORRESPONDENCE

The South Crofty mine during the half year ended Dec. 31 last, paid a dividend of 35c. per share on 40,000 shares. The average price received for black tin or tin concentrates for the year was £89 13s. 6d., and the wolfram realized £100 13s. 7d. per ton. The price of arsenic was low during the year, but this company managed to sell all the refined arsenic it produced. Every effort is being made to sink and equip Robinson's shaft, so as to extend a crosscut to the north in hopes of finding or intersecting some new lodes. The ground developed during the year amounted to 4697 ft., the largest amount in the history of the mine. The cost of development, including shaft sinking, was about £2 per ft., or over 3s. per ton of ore milled. The average recovery from the tinstone was 28 lb. per ton.

The East Pool and Wheal Agar mines now worked as one company, are not in a flourishing condition, although fully £30,000 have been subscribed as calls or assessments during the last four years. These mines are worked on the "cost-book system," and, therefore, when any profit was made it was divided among the shareholders and development had to look after itself, as evidenced by the engine shaft not being sunk 15 ft. for 30 years. The mines are now being placed in good shape in case mineral should be found.

DOLCOATH OPERATIONS

The Dolcoath mine earned a profit during the six months ended Dec. 31, 1910, of £24,515, and declared a dividend of 9d. per share on 322,000 shares. The tinstone crushed was less than usual, being only 44,669 tons, which returned £85,809. The royalties or lords' dues amounted to £5721, equal to 2s. 6¾d. per ton. The working costs were £1 5s. 5½d., leaving a profit of 10s. 11¾d. per ton. The development during the year was about 3000 ft., the driving was 1670 ft. One encouraging feature during the six months was the driving on a lode at the 510-fathom level, which averaged 60 lb. of black tin to the ton. The Williams' or the new circular shaft should soon be in working order. The station for the pump at the bottom is completed. The size of the section is 20x75 ft. and arched with 18-in. brickwork. The station at the 220-fathom level is also finished, waiting for the electric pumps. The operation of this shaft should materially reduce the working costs. It is well equiped, is vertical and thoroughly ventilates the mine. Great improvements are being made at surface for the more economical handling of the ore. The 60 heads of Cornish stamps have been substituted by 12 of Holman's pneumatic stamps, and the necessary new concentrators are in place. The average recovery of black tin was 44 pounds.

The Phœnix mine, near the famous Cheesewring, in the eastern part of the country, was financed in 1906 by the Cosmopolitan Proprietary Company. A new rectangular shaft has been sunk 120 fathoms. This shaft is away from the old and extensive works. A new method in Cornwall has been used to unwater the mine instead of pumping from the surface of the water. A crosscut was driven 34 fathoms from the bottom of the new shafts and then a 3-in. diamond drill hole extended 13 fathoms to the old workings and the mine is being drained. The new 80-in. Cornish pumping engine is said to be the best in Cornwall, and it is anticipated a high duty will be maintained with a full load.

TREATING OLD TAILINGS

The Cornwall Tailings Company is registered with £40,000 capital of £1 shares. The object of the company is to treat the old tailing heaps from Carn Brea and Tincroft mines. These mines are so situated that they cannot wash their tailings into the famous Red river as is the case at Dolcoath, East Pool, South Crofty, Wheal Grenville and other mines, but they have to stack the tailings much to the annoyance of the residents in summer time. The tailings' dump now being treated is said to be fully 1,000,000 tons, of an estimated average value of 17 lb. to the ton. The tailings were formerly carried by traction engine to the abandoned tin floors of Wheal Agar, situated on or near the Tolgus valley. During January, 3566 tons were treated, which yielded 12.9 tons of black tin, showing a saving of 8.1 lb. per ton. During February 4470 tons were treated, which produced 144 tons of black tin, leaving a profit of £842. The costs were 2s. 10d. per ton, and the recovery per ton was 7.2 lb. The plant has now been increased to treat 200 tons per day, and it is anticipated that the percentage saved will increase from 50 to 60. The company is largely composed of Australian mining men. The dump has been sampled by many different persons, but none ventured to work it, being afraid to lay out the necessary capital. Carn Brea and Tincroft mines do not today reject 17-lb. tailings, as the yield is much less than the 60 lb. of tin, when Tincroft was paying such large dividends. The average of these mines today is 27 lb. per ton.

There are several companies dredging, or preparing to dredge for alluvial tin. All the ground had been previously worked by the "old timers," and now machinery is being used to work the "rejects" of the old workers. At Redmoor a dredge is working most satisfactorily, after the suction-gas plant had been arranged by the makers to meet some difficulties. The deposit yields about 3 lb. of tin, with a little gold which is caught by the mercury. In the early days all the alluvial streams carried more or less gold and many good-sized nuggets were found. Red Moor Alluvial is situated about 4½ miles from Bodmin Road station, and the same distance from Lostwithiel and Bodmin towns. At Goss Moor, drilling over an area of 580 acres showed the value to be 1½ lb. of black tin to the ton. A 450-h.p. gas-producer plant was erected on the dredge, but it did not work well, and steam power is being substituted. A trial run was made and over five tons of black tin was sold at a good price. The bottom is of a clayey nature which carries the tin away. There was some talk of erecting a stamp mill to crush the coarse stone and gravel. The depth of the gravel averages 18 feet.

Gem Production in the United States

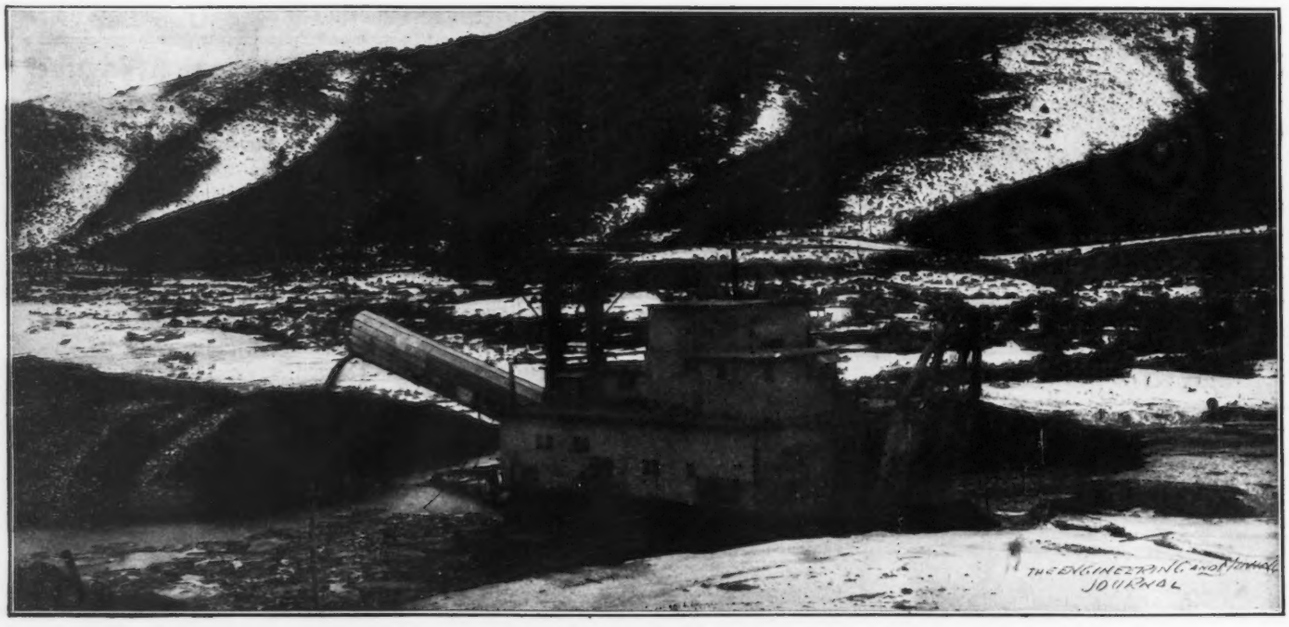
The total value of the precious stones produced in the United States in 1909 was $534,380, an increase of $118,317 over 1908. The increase is due, according to a press bulletin of the U. S. Geological Survey, to larger outputs of turquoise, tourmaline, variscite, chrysoprase, californite and kunzite. The production of beryl, garnet, peridot and topaz showed a decrease in value. The output of turquoise matrix and turquoise amounted to over 17 tons, that of variscite to over 3½ tons, and that of tourmaline to over 2½ tons. A beautiful new gem, benitoite, resembling the sapphire in some respects, has been found in San Benito county, California. Californite is compact, massive vesuvianite and resembles jade in hardness, texture and color, and should be a popular native gem. Chrysoprase has also been mined at a number of places in California.

Deposits of turquoise have been worked in Arizona, California, Colorado, Nevada, New Mexico and Texas. Turquoise is generally found in arid or desert regions, where mining is difficult. New Mexico, California and Arizona were formerly the chief sources of turquoise, but during the last few years Nevada has been one of the principal producers. Variscite, like turquoise, is generally found in desert regions. The output formerly came from Utah under the names of utahlite, chlor-utahlite, amatrice and variscite, but since 1908 a number of deposits found in Nevada have contributed to the production. Recently there has been an increased demand for this gem in the matrix.

Gold Dredging near Ruby, Montana

Near Ruby, Madison county, Mont., gold dredges have been operated since 1899. At present they are handling gold-bearing ground most economically by the use of suitably improved machinery. This dredging ground, although commonly known as that of the Conrey Mining Company, is, in reality, owned by two separate corporations, the Conrey Placer Mining Company and the Poor Farm Placer Mining Company. Recently they have placed in commission a Marion elevator dredge with buckets of 16 cu.ft. capacity, which is believed to be the largest and most powerful machine of its kind in the world. The details of this monster digger will be described, but before doing so, it may be of interest to consider the seven smaller dredges which led up to it, as well as some of the difficulties encountered and overcome before the present advanced stage of success was reached.

Conrey and Poor Farm placer-mining companies now operating four dredges. Buckets on Nos. 1, 2 and 3 are of 12-cu. ft. capacity. No. 4 is one of the largest two dredges in the world; has 16-cu. ft. buckets and the strength and weight of machinery throughout are in proportion; the machinery for this dredge was all shipped within six months of receipt of order.



MARION DREDGE, CONREY NO. 1, OPERATING NEAR RUBY, MONTANA

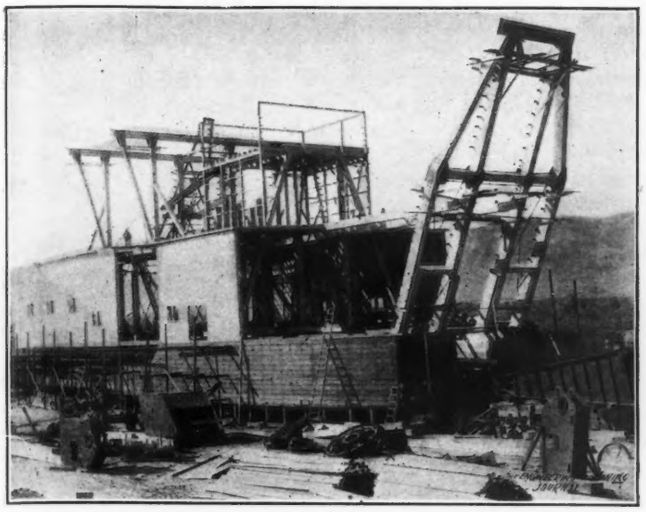
About 1896 this ground was bought by the partial owners of the present company from the Old German Bar Fluming Company, which had been operating by the sluicing method near the town of Junction, about half way up the gulch toward Virginia City. This method not being a financial success, it was decided to install a plant known as the Lidgerwood cableway, which consisted of a tower, a cableway and a flume. The cableway was used to haul a bucket of about 1½ cu.yd. capacity to the top of a tower, where the material was dumped into an inclined flume which deposited the washed portions to the rear. This first equipment proving too light, heavier machinery and tower were constructed. After operating this plant for several seasons without the desired success, it too was abandoned. In 1898 two orange-peel excavators were installed. These failed because of their small capacity and inadequate strength for this kind of digging, while at the same time they were not suitable for handling gold-bearing material on account of the construction of the buckets, which could not save the small particles of gold.

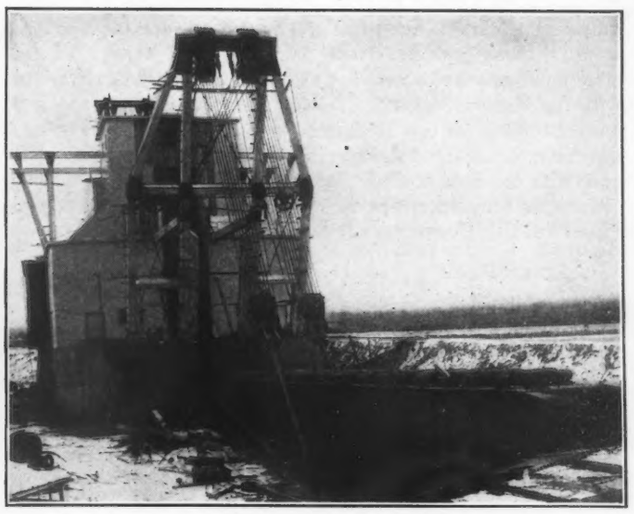
FIRST TWO DREDGES UNSUCCESSFUL

The next excavating device built was a floating dredge, known as No. 1 or Old Gordon. This was in 1899. It was reconstructed several times, but later on it also was abandoned, the machinery being too light and of inefficient design. In 1902, the dredge known as No. 2 was designed and built by the owners. While this embodied many improvements over the former dredge, it likewise lacked the strength to successfully cope with the severe digging encountered. Another bad feature was its being steam driven, which made it too expensive to operate, as coal in that part of the country is scarce. The boilers, filters and heaters occupied a great amount of space on board which could have been utilized for gold-saving appliances. Trouble was experienced with the boilers, due to the use of muddy water that was secured from the pond.

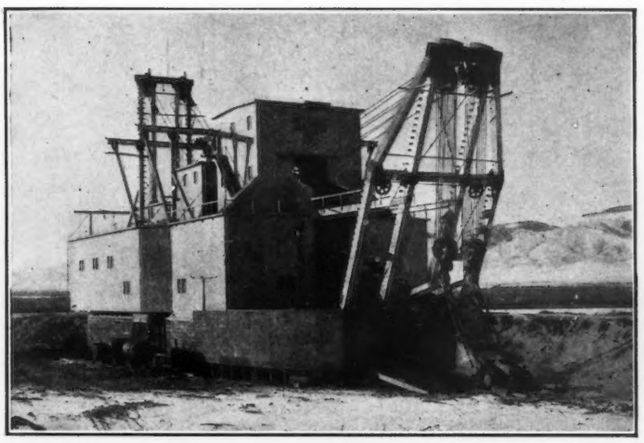
At the end of 1906 dredges Nos. 1 and 2 were discontinued, and No. 3 put into commission. This latter dredge had been under construction for two years. Although improved to the extent of being electrically driven, some of the features of the old dredges were retained, such as the long tail sluice, single lift, open-connected bucket line and the mooring-line system of anchorage. The bucket line consisted of buckets having 12 cu.ft. capacity, spaced alternately; that is, one space link between each bucket. The hull was 130ft. long by 48 ft. wide and 8 ft. deep. This dredge is still in operation, giving fairly good service.

From the foregoing it will be observed there had been a great deal of expensive experimenting in machinery and proving the ground. It still remained for a dredge to be designed and constructed that could

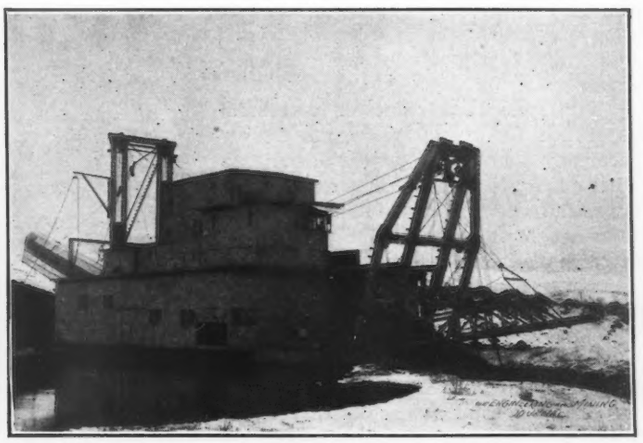




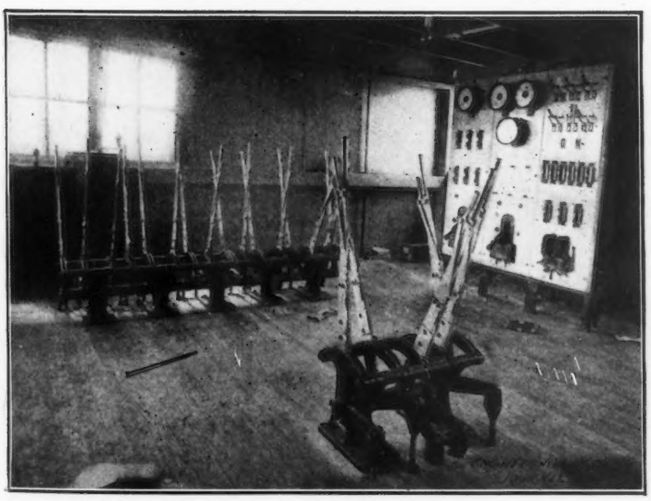
CONREY NO. 4 DREDGE DURING CONSTRUCTION, SHOWING DESIGN OF FRAMING, HULL AND DIGGING LADDER

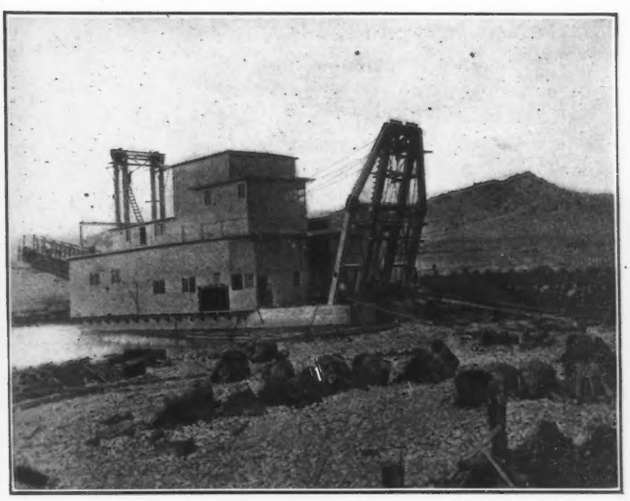


CONREY NO. 4 DREDGE DURING CONSTRUCTION



CONREY NO. 2 DREDGE IN OPERATION





PILOT HOUSE AND VIEW DURING CONSTRUCTION OF CONREY NO. 1 DREDGE

handle the hard material existing in this gulch. Climatic and local conditions required considerable attention. After considering these problems from every possible point of view, a contract was placed with the Marion Steam Shovel Company, June 29, 1907, for two dredges to be built on the latest and most successful plans known to the industry, with such modifications as the experience of the Conrey Placer Mining Company warranted.

Later Dredges Satisfactory

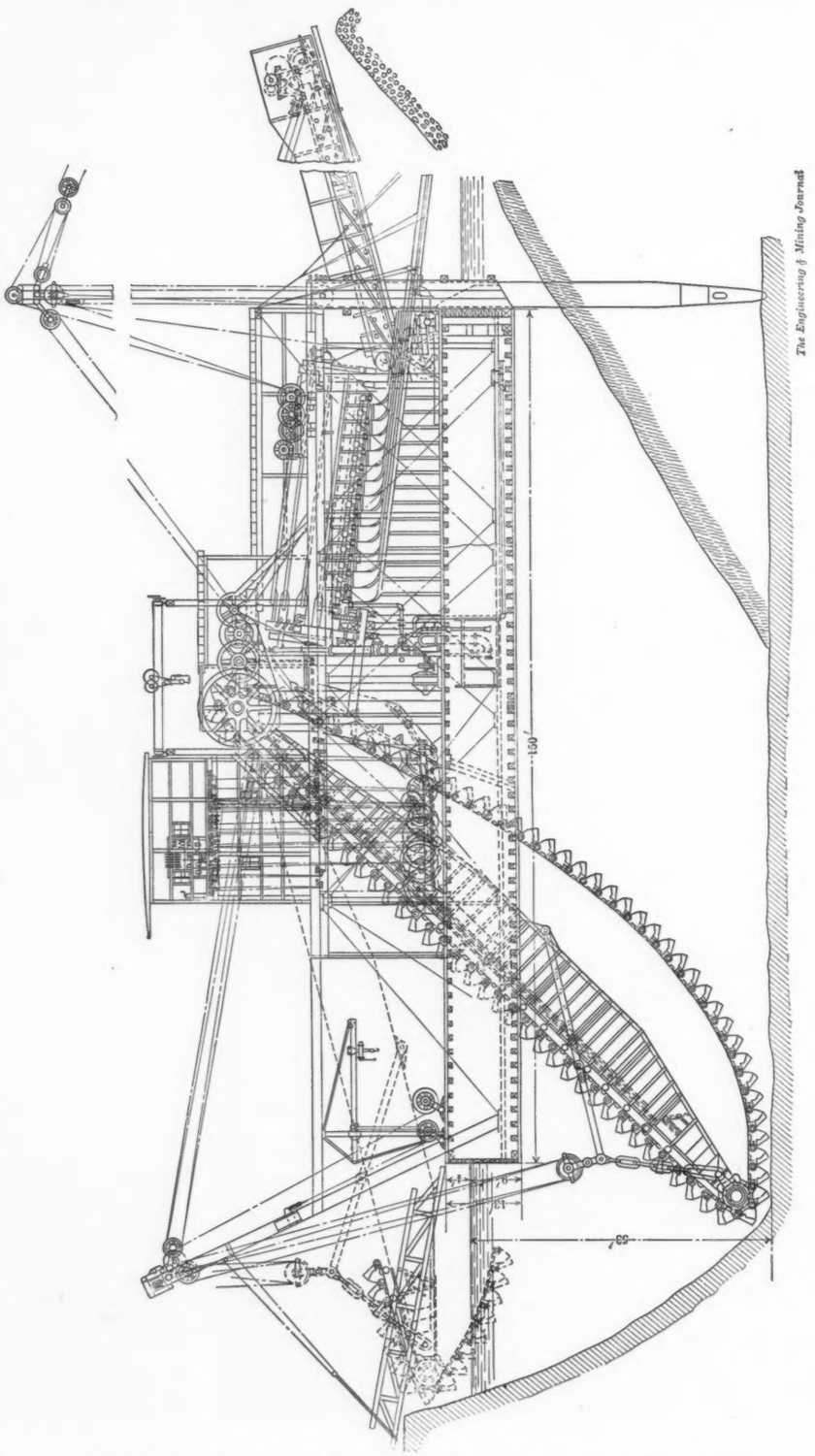
The two dredges ordered were quite similar, differing only in the size of some of the machinery. They were designated Conrey No. 1 and No. 2. No. 2 was designed to dig 35 ft. below the water line, No. 1 only to 28 ft. Since their installation they have been operating successfully and continuously during winter months, the temperature at times being 30 deg. below zero. They have close-connected bucket lines, belt stackers and are equipped with spuds intead of mooring lines, which makes them more flexible for maneuvering. They are also better gold savers, are operated at less cost and can handle the gold-bearing gravel with little loss and no need of retreatment.

With these two dredges in successful operation for several years, the Conrey company learned by actual experience that quality is the most important factor, regardless of first cost. Experience has also taught them that the larger the dredge, the more economically the material can be handled. So after further consideration they placed another order with the Marion company for a 16-cu.ft. elevator dredge, to be known as No. 4, designed for digging 53 ft. below the water line. The contract was placed Feb. 18, 1910, and although the construction of this machinery required a complete new set of drawings and patterns, it was practically all shipped within six months from receipt of order—a most creditable achievement.

Heavy Machinery in No. 4 Dredge

The No. 4 dredge is 150 ft. long, 13 ft. deep, with a deck-bearing surface 68 ft. wide. A heating system was installed, making it possible for the dredge to operate during the coldest weather and, on account of its working during the winter months when ice accumulates in the pond, the hull was sheathed with ¼-in. plates, so as to eliminate all danger of the sides being punctured, thereby flooding the hull. The machinery for this dredge weighed 2,280,000 lb., and 654,000 ft. of lumber were used in building the hull. The bucket ladder is of the plate-girder type, 11 ft. deep, 116 ft. long. Twenty-one high-carbon steel rollers are used to support the bucket line of the ladder. The total weight of this ladder and rollers is 112 tons. These parts were shipped in sections and put together in the field. The heaviest parts of the machinery shipped in one piece were the spuds, each of which weighed 42 tons. To transport these from the railroad station to the dredge—a distance of about one mile—it was necessary to build a track of steel rails and ties, as it was impossible to secure wagons or trucks strong enough to haul them.

The bucket line consists of 80 buckets of 16 cu.ft. capacity, each bucket weighing 4400 lb. These consist of special high-carbon steel with special heat treatment. The base and hood portion of each bucket is cast in one solid piece with a manganese wearing plate inserted in the bottom of the bucket to withstand the wear as they pass over the upper tumbler. The manganese lip, 2½ in. thick, is riveted on the cutting edge of the bucket, and can easily be replaced when it becomes too worn.



Sectional Elevation of Marion 16-cu.ft. Electric-driven Dredge

For raising and lowering this bucket line and ladder a 600-ton hoist is placed on the lower deck, inside the house, and is driven by a separate motor of 200 h.p. The motor is of the variable-speed, reversible type, and is connected to the drums by a series of reduction gears. The first reduction shaft is fitted with an automatic brake that permits the ladder to be raised, lowered, or secured in any position, by the manipulation of the motor controller only. This feature is a great improvement in elevator placer-mining dredges. At the present time many dredges are constructed with this hoist connected to the digging motor.

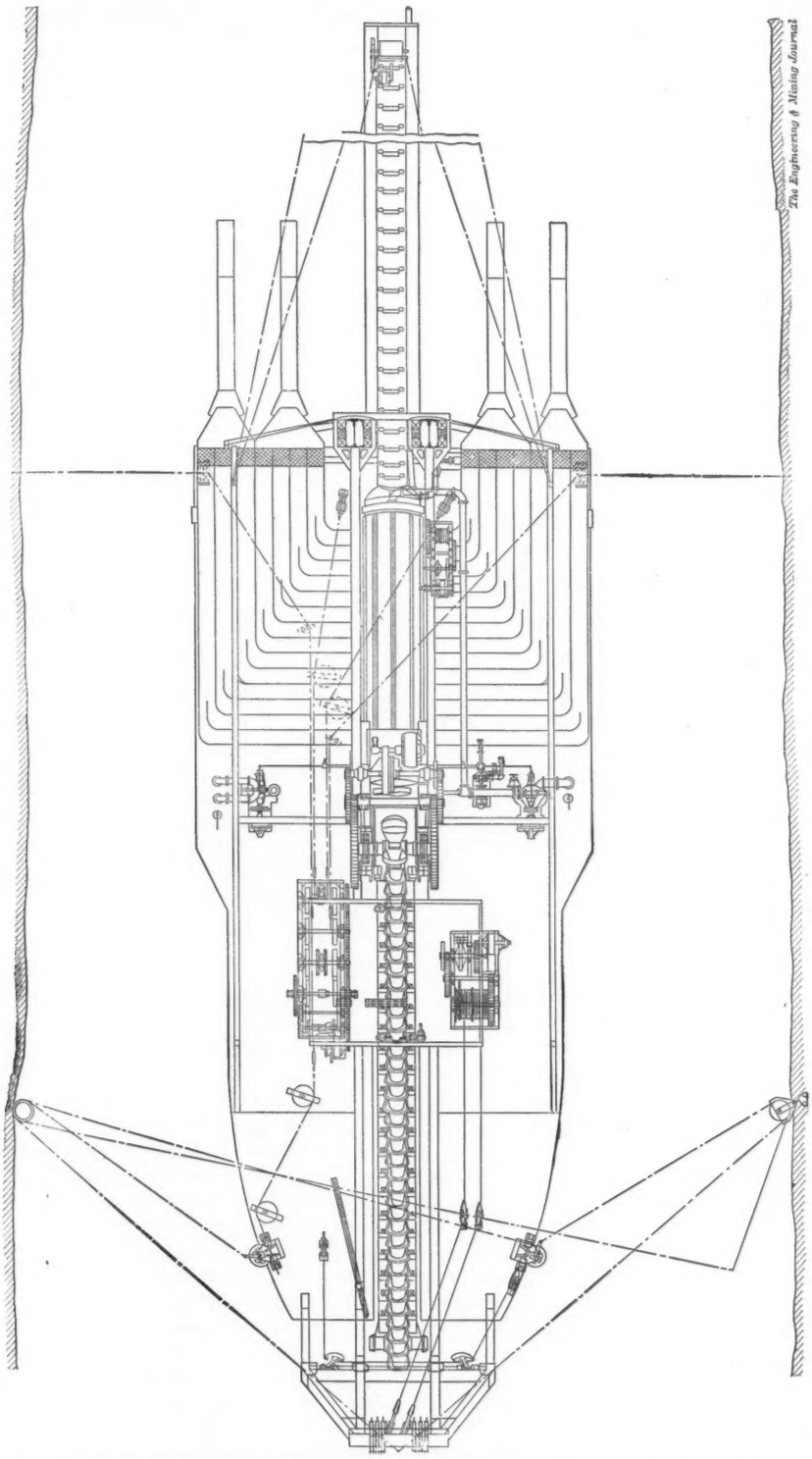
The main drive which operates the bucket line consists of heavy steel castings and gearing direct connected to a 300-h.p. induction motor. The main driving shaft on this drive is 25 in. diameter, while the main gears are 14 in. diameter, and have a 14-in. face. All gears on this drive have cut teeth. The first reduction shaft is equipped with a friction clutch which disengages the motor and acts as a slipping device. The drive complete, with motor, weighs 93 tons.

The revolving screen, which receives the material after it is dumped out of the buckets, is 9 ft. 9 in. diameter and 50 ft. long, and, together with its drive weighs 82 tons. The large boulders pass through this screen to the belt conveyer, while the fine gold-bearing material passes through the perforations into the gold-saving tables which are made of steel and arranged in a way that increases the gold-saving area, as it has been demonstrated on previous dredges that this area should be as large as it is possible to make it.

The tailings stacker is 130 ft. long, and is built of solid plate girders decked over with a steel plate and built deep so that the stacker belt passes through it on the return. The whole stacker is inclosed with canvas covering and the bottom is equipped with a flue constructed of sheet steel, for heating. It is raised and lowered by a hoist located in the upper cabin, direct connected to a 35-h.p. variable-speed motor. This hoist is equipped with an automatic brake to lock the stacker in any position when the power is off and it is controlled by the motor controller alone.

In the pilot house 24 operating levers are so arranged that one man controls all the movements of the dredge. This house also contains a five-panel marble switchboard. Each motor has its separate line from this switchboard. All motors are equipped with automatic circuit breakers. All the wires on the dredge are in conduit. Two 10-ton traveling cranes over the main drive or upper-tumbler gearing travel the full width of the boat and are overhung about 2 ft. A three-ton electric hoist was placed on a jib crane for use in handling buckets while being repaired, and to lift large boulders, chunks of ice and frozen ground from the bucket line. The accompanying illustrations show clearly the general construction of the dredge, as well as giving an idea of the conditions under which it is operated.

The electric equipment was furnished by the General Electric Company. All motors are direct-geared, operated by 2200-volt current. The total motor installation on the dredge is 1045 h.p. No belts are used. By using 2200-volt motors it is not necessary to have transformers on board, and current can be transmitted from substations at considerable distances without loss. The current generated on the Madison river, about 40 miles away, is transmitted to the substation at 46,200 volts. In designing this dredge no expense was spared to make it the most complete and perfect dredge yet constructed.



PLAN OF MARION 16-CU.FT. DREDGE FOR DIGGING 53 FT. BELOW THE WATER LINE

Boston Consolidated Mill—I

By Claude T. Rice

Early history of concentrating tests on porphyry ores. Nissen stamps adopted after thorough tests. Little slime was produced and metal recovery was high.

With the realization of the possibilities of the low-grade monzonite of Bingham as a source of copper, an entirely new class of concentrating ores sprang into importance. The Bingham monzonite, with only 6 per cent. of sulphides is a decidedly different material from the older classes of concentrating ores, with, say, 20 per cent. of sulphides. As late as 1906 the porphyry ores were but little understood, and many hold that this is still true, when they see the present tenddency to seek tonnage to attain low costs, instead of making a higher extraction of the copper in the ore. In reducing the cost per pound of copper, as much is accomplished by increasing the saving of the copper 5 per cent. as by racing an immense tonnage through the mill, for when the extraction is not greater than 65 per cent. of the contents of the ore, and an increase of 5 per cent. in the saving is made, the amount of copper saved is 14/13, and the cost per pound of copper produced is 13/14 of what it was, or 1/14 less than before; on the other hand a decrease of 5 per cent. in the operating costs would only result in a saving of 1/20 in the cost of producing each pound of copper.

Close Saving Better Than High Tonnage

The greater importance of increasing the efficiency of the milling operation rather than decreasing the cost by increase in the tons treated, which affects in the main only standing charges, seems not to be appreciated sufficiently by all operators of low-grade copper mines. Their whole idea is tonnage, a customary obsession of mine management during certain stages of the development. But some mine executive finally realizes that the grade of ore hoisted is more important than the amount of it. The mine superintendent then resorts to closer sorting in the stopes. The tonnage drops, but the profits increase. And so it will be in future years in the handling of the porphyry mines, only in this class of ores the closer sorting and saving will be in the milling, not in the mining department. In time the tonnage hysteria in the low-grade copper mines of America will surely undergo the same cycle as the hysteria for tonnage has followed in South Africa. But even in this day, I wish to call attention to one mill preëminent for the high extractions made by it on a low-copper head.

It is to supply a full record of what this mill at Garfield accomplished that this article is written, as that is the only concentrator in the world that for over two years made an extraction of from 69 to 72 per cent. of the copper on a head that varied from 1.4 to 1.6 per cent. This record will be appreciated by those who mill the low-grade porphyry ore 10 years from now, when the tonnage hysteria has run its course, and the properties and their working have settled down to every-day existence, and the managements can, as was finally the case at the Homestake mines, pay attention to their slime.

Stamps as Crushing Machinery

In 1906 the mining world was startled by the announcement that the Boston Consolidated Copper Company was going to use stamps for crushing in its new mill, at Garfield, Utah. The experience of Butte with steam stamps was recalled, and frequent were the predictions of dire calamity. But finally men began to appreciate that the results attained on the ores would be the test—not the history of the past.

While the determination of the Boston Consolidated company, or rather of A. J. Bettles, its metallurgical engineer, to crush the Bingham porphyry ores with stamps came as a shock to the mining world, so astounding did it seem even to think of using stamps for crushing a concentrating ore, the fact remains that it was not anything new to use stamps on the Bingham porphyry ore, this having previously been done successfully on a small scale.

Mr. Bettles built a small testing mill in Bingham cañon on the company's ground near the Ohio Copper Company's line. This was a gravity mill equipped with a five-stamp battery, three Wilfley tables, a Frue vanner, and a Johnston table, with the necessary classifiers and settlers.

The early tests were to ascertain the proper screen aperture to give the best screen analysis of the pulp, for the main losses were in the largest sizes and in the pulp which passed a 200-mesh screen, which in this article will be called slime. It then became necessary to test out the tonnage which could be crushed by the stamps. This resulted in the decision to try the individual stamp on the ore. The Nissen stamp was tried as it was then the only one giving promise of success, and these tests resulted in its selection for the mill. In these tests it was clearly shown that the Nissen stamp not only gave a greater return per horsepower in crushing, but the pulp from the Nissen stamp contained fully 7 per cent. less slime than the pulp from the five-stamp battery.

Action of the Nissen Stamp

The reason for this is not merely that each Nissen stamp has a discharge area equal to about two-thirds the screen area allotted to five stamps in an ordinary battery, for probably almost fully as important is the fact that in the individual stamp a strong suction action is developed, which drags the coarser particles back upon the die, while owing to the strength of this suction the finer particles are kept better in suspension and to a large extent off the die. Moreover, as the ore is fed directly upon the die, there is always some ore under the stamp so as to cushion the blow, and rarely is a stamp crushing on a thin bed as is the case in the five-stamp battery where the center stamp regulates the feed for the other four.

These early tests also showed that in concentrating the pulp from the stamp, the suspended type of vanner was slightly better than the older Frue type, which lacks the oscillatory motion imparted to the belt in the newer type. Moreover, it soon became quite evident that the bulk of the concentrates could be saved much more cheaply and more efficiently upon Wilfley tables than upon vanners. Several different types of classifiers were tried out, but none of these gave any better classification than the slightly modified form of the Anaconda type of hydraulic classifier described in the Journal, Nov. 19, 1910.

Screen Analyses

A study of the screen analyses shows that the copper-bearing minerals slimed badly and that in consequence of this each successively finer portion of the pulp assayed higher than the next coarser one until the undersize from the 200-mesh screen was reached. At that point there seemed to be a place where other of the minerals, such as the micas and certain ferruginous minerals that had begun to decompose, slimed worse than the sulphides.

The screen analysis of the tailings shows that the saving was best on the sizes between 100 and 200 mesh; above that range of size there was copper mineral still included in the gangue particles, while the undersize from the 200-mesh screen acted so differently in regard to concentration that it was evident that the sulphide in it must be extremely small

compared with the sulphide particles in the oversize.

Influence of Kind of Screen

There is another fact in connection with the amount of slime produced in a stamp mill that is not fully appreciated by millmen, especially as it is only lately that much study has been devoted to this matter. This is the importance of the shape as well as the size of the discharge apertures in the screen used on the battery. A long narrow opening discharges more readily than does the same area when distributed among several square openings having the same width. Of course, friction is the main thing that causes this difference, but then the fact that a long-shaped particle can get through the long opening that could not pass the square opening is important. Moreover the angle of the faces that meet to form the opening is important. For instance, an Allis-Chalmers diagonal-slot screen punched with a narrow margin so as to be the equivalent of a 26-mesh No. 26-wire screen will give less slime in the discharge than does the last-named screen through its square apertures. On the other hand, the Tyler rolled-slot screen having the same shape of opening as the punched screen and made also to be equivalent to the 26-mesh screen just named, makes less slime when used on a battery than does the punched screen. The reason for this is that the rounding surface of the wires forming the sides of the openings act as loading chutes to steer the particles into the mesh.

Possibly it may be the failure to appreciate this fact that caused the stamp to be discarded because it made more slime than did the chilean mill when testing some of the other low-grade copper ores, as was for instance the result of the experimenting when the Nissen stamp was tried on the Miami ore by Mr. Burch. Another consideration is that the ore used in the tests to determine the manner of crushing the ore generally comes entirely from drifts and as it is badly shattered by the large amount of dynamite that is used in such workings compared with the amount used per ton in stopes, the ore itself crushes much differently than does the ore that later goes to the mill. This favors one method of crushing more than the other, and not necessarily the one that inherently makes the most slime in crushing a stope ore. Therefore, in the tests made to determine the relative sliming effects of different manners of crushing ores, it probably would be a wise policy to use only the oversize from a four- or five-inch grizzly as being less fractured by the powder than the undersize and more typical of the ore that would come from stoping the deposit. But anyone testing stamps for use in crushing a concentrating ore should certainly remember the importance of a long slot opening in reducing the amount of slime.

The Boston Consolidated company when it designed the mill at Garfield was planning to mine the ore by means of steam shovels, and this fact had an important bearing in the determination of many features of the Boston Consolidated mill. But later, finding that the ore under the area which had been stripped contained too much pyrite to be mineable at a profit, the company was compelled rather hastily to abandon that manner of working its mines, as it required too much capital to add to the equipment so as to open up new areas quickly enough to supply the needs of the mill. It was owing to the change in mining methods, that the mine got so far behind the mill, while the unreadiness of the mine was the main reason why the mill was so long in the course of erection and why the different units were so far behind one another in being put into operation.

Mill Started in Jan. 26, 1908

The first unit of the Boston Consolidated mill started Jan. 26, 1908 and the second unit began crushing the next day. The third unit began crushing in February, 1908. The fourth unit began on May 16, 1908, the fifth, Sept. 21, 1908, the sixth, Sept. 22, the seventh, Sept. 24, the eighth, Sept. 25, 1908. The ninth began to crush ore on Jan. 10, 1909, the tenth, Feb. 18; the eleventh on April 18, the twelfth on May 25; and the last or thirteenth on July 8. 1909.

Mill of the Boston Consolidated Copper Company, Garfield, Utah

The most notable point in the Boston mill was that the pulp flowed entirely by gravity from the top to the bottom. This system has also been adopted in the Miami mill. One of the features of the Boston mill that is likely to be adopted in many mills in the future is the system of tunnels and cross tunnels under the different terraces, in which the water and the pulp launders are placed out of the way of everything. This has already been adopted in one mill, viz.: Moctezuma at Nacozari, built by Mr. Burch, and also in a modified form at Miami, I am told.

The tables of the Boston mill were arranged head to head and in lines running with the slope of the terraces so as to allow the driving shafts, belts and feed launders for the two rows to be placed

near to the machines and in such position that the light from the windows in the gables of the roof was not shut off from the tables. This arrangement not only gives better lighting, but also there is a large saving in the amount of belting to drive the machines. A minor feature in the construction of the launders was the use of plate-glass instead of wooden bottom lining, as less expensive in the long run.

The most noteworthy thing in the Boston mill, after the use of the Nissen stamp, was the use of the Wilfley table for the saving of 80 per cent. of the concentrates and 85 per cent. of the copper recovered. All the concentrates were passed over Wilfley tables after very close classification into four different sizes. Those tables that treated the coarser sizes made tailings so low in grade that they would not pay for the cost of recrushing and retreatment. The tailings from the other tables were sent to the Johnston vanners to recover the fine grains of mineral passing the Wilfley tables. In this way Mr. Bettles was able to throw the work on the Wilfley tables to a remarkable degree. A Wilfley table does not cost more than two-thirds as much to operate as does a vanner, but there is a slightly greater first cost for the tables.

Another notable point in the design of the mill was the use of electric power supplied by the Telluride Power Company to run the mill. Many thought that there would be vexatious delays on this account, as the power is brought in over a transmission line 76 miles long. However, the time lost at the mill on account of power lines being out of commission was less than 1 per cent. of the total running time, while the total loss of time due to all causes was less than 5 per cent.

Small Drive-units

The use of purchased electric power rendered advisable the employment of more clutches on the driving shafts throughout the plant than would otherwise have been necessary; but such subdivision of the system of driving, so that small units can be shut down without bother to the other parts of the plant, is a good feature. For instance, each row of 11 Wilfleys was driven by a separate clutch while the drive of the vanners was controlled by three different clutches. Needless to say, this provision is absolutely necessary in a mill that is driven by power purchased on a peak-load contract, so as to keep the starting moment for the plant as low as possible.

The decision of the Boston company to use the Telluride power was influenced by the impurity of the water available for boiler use at Garfield. Its engineers calculated that it would cost over $55 per h.p. to generate steam power, and in fact it costs the Utah Copper Company about $52 per annum. The Telluride Power Company offered the company a contract at less than $40 per h.p. per year for 2500 h.p., a somewhat larger quantity than the mill would require until its capacity had been increased by adding rolls or gyratories below the smaller gyratories now in the crushing plant so that the feed going to the stamps would be about 0.5 in. size. In this way the capacity of the mill was to have been raised cheaply to somewhere between 4000 and 4500 tons a day. Nevertheless, the contract resulted in a saving of about 4c. in the cost per ton of ore milled as compared with steam power.

Separate Crusher House

The Boston concentrator has a separate crusher house, thus avoiding dust in the main mill building and enabling the bearings on the cam shafts to be operated without caps, which is a desirable thing in running a stamp battery where irregular alinement of shafts and bearings is in time bound to occur.

The mill is built near the top of a slope, gentle but sufficient to insure gravity flow, while on account of the ease of the slope the amount of grading was minimized and no great expenditure was required for retaining walls, a frequent drawback to side-hill construction. About 12,000 bbl. of portland cement was used for concrete foundations, piers and monoliths required by the tunnel system under the mill building.

The mill has a wooden floor. This is less costly than concrete, but is not as fireproof; however, after the construction period, the floor being wet when the mill is in operation, there is no great danger from fire. The main disadvantage is that the wood floor is apt to rot in a short time. But as the tunnels tend to keep the floor drained, the wooden floor at the Boston mill will probably have a greater life than similar floors have had at other mills. Another drawback is that the mill cannot be kept so clean as with a concrete floor. But if the tables are operated properly and the vanners are kept in adjustment so that there is no side-slopping of the pulp over the rim of the belt, this need be no great matter; especially if, as is the case at the Boston mill, there are no elevators or centrifugal pumps handling pulp.

Evils of Concrete Flooring

The great objection to a concrete floor is that in cold climates it is likely in the winter to bring on rheumatism among workmen. This is a serious drawback, for it causes the best millmen to seek employment in other mills. However, this drawback can be overcome easily by using slat walks as at the Ohio mill.

Both the buildings are constructed with a steel frame and corrugated-iron sides. The mill contained 312 Nissen stamps, 52 hydraulic classifiers, 156 cone settlers, 299 Wilfley tables, 156 slime settlers and 234 Johnston vanners. About 70,000 tons per month was the rate at which the mill was run during most of the time, but until after the merger was effected, it was never supplied with as much ore as it could handle. Since then the mill has treated, according to reliable information, as high as 100,000 tons a month. This was done by changing to the Tyler rolled-slot screens on the batteries. This was not the ultimate capacity of the mill, as it is calculated that by increasing the weight of the stamps to 1800 lb. and by crushing the feed so that it would pass an 0.5-in. ring, the capacity of the plant could have been increased to about 4500 tons a day.

The highest monthly tonnage crushed with the feed passing a 1½-in. ring, the stamps weighing 1600 lb. and Allis-Chalmers punched diagonal-slot screens on the batteries (equivalent to a square-mesh, 26-mesh, No. 26 wire screen) was 80,845 tons, in January, 1910. This gave a stamp duty of 8.76 tons per 24 hours, but that was not the highest stamp duty attained for the whole mill as in March, 1909, a duty of 9.09 tons per stamp per 24 hours was averaged throughout the month.

Steel Frame Coarse Ore Bin

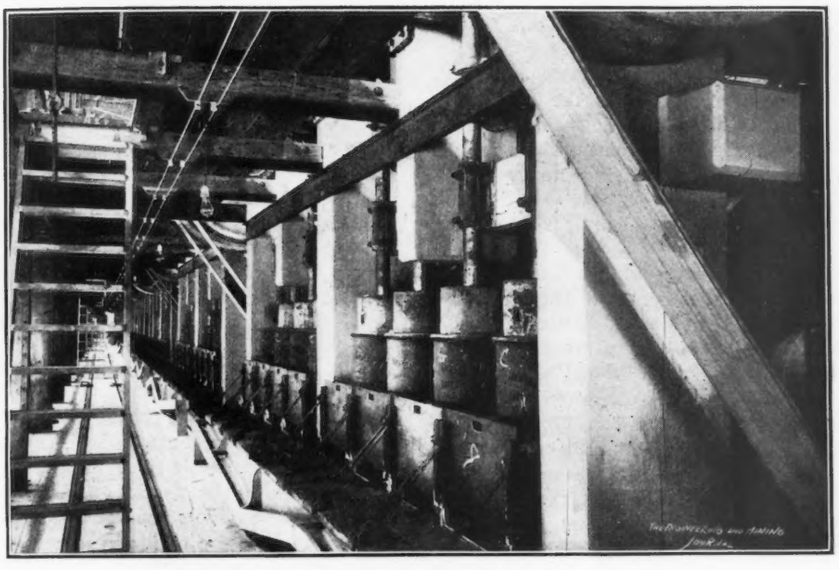
The coarse-ore bin is 300 ft. long, 34 ft. wide and 20 ft. deep. It has a capacity of 12,000 tons. The frame of the bin is made of structural steel while the sides are formed by a double lining of 2-in. planks nailed to strips bolted to the steel frame. A wood lining is used as it was cheaper and there was no need of fireproof construction, since the coarse-ore bin is not connected with the main building. The bin is surmounted by two railroad tracks. The ore from the bin is fed to two conveying belts by a special type of feeder arranged in two rows of 40 each, the feeders being 7.5 ft. apart. In the sides of the bin, just above the feeders and in line with the different openings in the bottom through which the ore runs down to the feeders, are a series of openings 4 ft. high, which in order to prevent the ore from running out through them are closed by means of three horizontal slats. Through these openings an opportunity is afforded to work a punching bar down through the mass of ore and start any boulders that may have clogged the feed opening in the bottom of the bin. In the winter the ore is likely to freeze near the points where cold air strikes the wet ore; especially where the ore is discharged from the bin. By means of the slat-closed openings in the sides of the bin it is possible to work a charge of dynamite into the ore at a point directly over the frozen mass blocking the discharge opening. In this manner the ore, unless the freeze-up is especially severe, is easily and cheaply started. To allow the

men convenient approach to these punch holes a balcony is carried along each side of the bin even with the bottom of these holes.

These punching openings have been found to be the only instance, at least in the West, where any manner of access to the interior has been provided in the sides of an ore bin. No doubt this will prove to be one of the minor innovations that will be copied in the design of bins for cold climates where trouble is had from freezing of the ore, or where there is trouble from large boulders.

Belt Feeder for Coarse Ore

The feeder that is used on the coarse-ore bin is a form of the traveling-belt type that is used at some of the coal bunkers in the East, but it has been modified somewhat to adapt it to the new conditions attending the handling of large ore boulders. The use of this form of feeder was influenced by the expectations of large boulders in the ore from the steam-shovels, and this was also one reason for providing the punch openings or stoker holes as they are called at the Boston mill.



Nissen Stamps, Boston Consolidated Mill

These feeders consist of a traveling belt, 36 in. wide, which conveys the ore that runs down on it through the hole in the bottom of the bin to a steel chute inclined at an angle of 30 deg. with the direction of the belt travel. The ore is prevented by its angle of repose from running out of the bin, as the belt of the feeder is plenty long enough to attend to that matter.

This belt is fed ahead by a ratchet wheel operated by a pawl on a wheel mounted eccentrically on a driving shaft. The speed of the belt travel is adjustable so that it can be varied from driving shaft. The speed of belt travel is an advance of 1.25 to 6 in. per revolution of the eccentric shaft. By raising the pawl the feeder is thrown out of operation without affecting the others. They are driven in groups of 12 from the motor that runs the coarse crushers by means of a rope drive.

These feeders have worked satisfactorily; large boulders cause no difficulties with them, and the cost of repairs has been practically nil. It takes only one man to watch these feeders and keep them operating properly. These feeders, of course, are higher in first cost than a pan type of feeder, the only other type that could be used under the conditions, but are thought to be more satisfactory for this work.

Belt Conveyers

On the two conveyers built by the Stephens-Adamson company a Scandinavian belt was used at first. These lasted about a year and a half. They were replaced with the best grade of rubber conveyer belt, as experience had shown that while the Scandinavian belt was cheaper in first cost it was more expensive in the long run. These two conveyer belts are troughed and 30 in. wide.

Each of the belt conveyers takes the ore up a slight incline and then feeds the ore to a grizzly having bars 7 ft. long spaced to give 1½-in. openings and set at an angle of 30 deg. The oversize from each grizzly goes to a No. 6 Gates gyratory crusher. The undersize from these grizzlies, after being rejoined by the crushed oversize, is either taken by conveyer or passed by chutes to two trommels, 12 ft. long and having a diameter of 2½ ft., on which a cast-iron screen ½ in. thick and having holes ½ in. in diameter is used. Each trommel feeds its oversize to a No. 5 Gates gyratory crusher, set to break the ore to 1½ in. size.

This recrushed ore then rejoins the undersize from the trommels and is taken by two Stevens-Adamson belt conveyers, 18 in. wide, up an angle of 20 deg. to one of two distributing belts, also 18 in. wide. Each of these serves half of the fine-ore bin. These distributing belts are dumped by traveling trippers that discharge the ore over the end of the belt, and in this manner an even character is assured to the ore throughout the fine bin.

The fine-ore bin, which has sheet-steel sides and like the coarse-ore bin is made with a flat bottom, is 580 ft. long, 22 ft. wide and 20 ft. deep, so that it holds about 16,000 tons when filled. It is in the mill building proper between the two rows of Nissen stamps originally installed. In fact the bin structure formed part of the frame for the stamps.

The two No. 6 crushers and the automatic feeders, as well as the two coarse-ore conveyers, are run by a 150-h.p. motor, while the two No. 5 gyratories and the trommels are run by a 75-h.p. motor. The two belt conveyers are run by a 30-h.p. motor, while each of the distributing belts at the fine-ore bin is run by a 20-h.p. motor. All of these motors are of the Westinghouse induction type, as are the other motors throughout the mill. They all take a 440-volt, three-phase, 20-cycle current.

The mill building is arranged with three terraces. The first was the stamp floor, the second the Wilfley floor, while on the lowest were placed the Johnston tables, together with the Wilfley that is used in each section for reconcentrating the middlings made on the upper Wilfley tables. The wooden floor is carried by joists that rest on concrete pillars, while under it are the several tunnels and cross tunnels. These are kept open by means of plank-lagged drift sets.

Stamp Battery Construction

The Nissen stamps rested on two long massive concrete monoliths, one for each row of stamps. The battery frames were made of wood, the posts standing in cast-iron shoes extending up on the posts about 8 in. The shoes were in two sections, held together by bolts placed outside the wood of the battery posts, and, of course, were anchored to the concrete mortar block. Between the mortars and the concrete block a disk of rubber ½ in. thick was placed.

The stamps were mounted in batteries of eight, each further divided by a center post into sets of four. A frame for four stamps consisted of two 14x26-in. end posts, one 20x26-in. center post, two 14x26-in. jack posts, two 14x20-in. overhanging jack beams for the jack posts to rest on, and two 14x16-in. girts. Each post was braced against the bin frame by wooden beams resting in brackets on the bin posts and held there by tension bolts. Each set of four stamps had its own cam shaft so that the center post of

U of M

the battery frame carried a double bearing. The cam shaft was made of wrought iron, it having been found that on account of the carbon in them the steel cam shafts, first used, broke too frequently. All the steel cam shafts had to be replaced in the first two years that the mill was running. The diameter of the cam shaft was 6 in., and that of the stamp stems 4 inches.

Stamp Drive

Each group of 20 stamps was driven by a separate motor, mounted on the battery-bin foundation where it was easily accessible. A 14-in. driving belt was used for each set of four stamps, while the driving pulley was 72 in. in diameter. The jack posts used in the battery frame proved to be a mistake as they resulted in too much vibration, but they were used to save floor space. In building another mill of this type all the posts would extend to the mortar block.

The cams were fastened to the cam shafts by means of Canda self-tightening fasteners. The tappets and the cams were of chrome steel, while the stamp stems were made of wrought steel. These worked in two cast-iron guides. The dies and shoes were made of white iron and cast in the company's foundry at the mill. The battery shoes and dies are considerably heavier proportionately in the Nissen stamp than in the ordinary gravity stamp, and each weighs approximately 325 lb. They ordinarily last about 50 days.

The stamps originally weighed 1500 lb., but later by means of weights they were increased to 1600 lb. They were run at 110 drops per minute, and with a drop equal to 7 in. The hight of discharge varied between 1½ to 2 in., being as low as possible. On the batteries, for some time, Allis-Chalmers diagonal-slot screens punched with a narrow margin, equivalent to a 26-mesh No. 26 wire-cloth screen, were used. These punched screens lasted on the average about seven days. About 10 gal. of water a minute were fed to each stamp. The ore was fed to each stamp by a Challenge feeder. The actual power consumed by each stamp was 3⅓ h.p., while theoretically the stamps should have required about 3.1 h.p. were there no friction. The base of the mortar was so heavy that no anvil block was needed under the mortars to distribute the weight over a large surface on the mortar block. In order to keep the hight of the discharge even, liners were used under the dies. These had a groove on one side and a raised ring on the other, which fitted into the groove on the die.

Effect of Change of Battery Screens

In the earlier work in the mill when a 26x26-mesh, No. 26 wire-screen was in use on the batteries, a screen analysis of the battery pulp showed 12.5 per cent. on 50-mesh, 14.5 per cent. on 80-mesh, 9.5 per cent. on 100-mesh, 17 per cent. on 150-mesh, 1 per cent. on 200-mesh and 45.5 per cent. through 200-mesh. The pulp obtained when diagonal-slot screens of equivalent opening were used was 16 per cent. on 40-mesh, 10 per cent. on 50-mesh, 19.5 on 80-mesh, 9.3 on 100-mesh, 7.7 on 150-mesh, 3.6 on 200-mesh and 33.9 per cent. through 200-mesh screen, a reduction of slime from 45.5 to 33.9 per cent. The Tyler rolled-slot screen which was last used gave not only still less slime in the battery pulp, but it also resulted in an increase in the crushing capacity of the stamps of 0.5 to 1 ton in 24 hours.

The mill was divided into 13 units, each of which contained 24 Nissen stamps, four three-compartment hydraulic classifiers of a modified Anaconda type, 24 eight-foot Callow cones, 23 Wilfley tables and 18 six-foot Johnston vanners. An accompanying flow-sheet of the mill shows the original flow of the pulp through the mill, but this was slightly modified, and a few classifiers and a Wilfley table added to each section on the vanner floor as will be explained later. Another drawing shows the plan of a section in the mill, while a third gives a longitudinal view of the mill. Each unit in the mill is an exact counterpart of every other one.

Glass Launder Bottoms Used

The plate glass used for launder bottoms throughout the mill varies in thickness from ¼ to ⅝ in., according to the proportion of the pulp passing. The glass is laid on the bottom of the launder and is held down by two quarter-round cleats nailed in the corner of the launder. The life of the plates, of course, depends upon the size and quantity of the particles going over them, but the indication is that they will last from three to four years. Such a plate-glass lining cannot be used for pulp in which the maximum size of particle is greater than 3.5 mm., as with larger particles the wear is too great.

(To be concluded)

Testing for Tellurium in Minerals

The test for tellurium, of heating the suspected substance with strong sulphuric acid, is familiar to all chemists and engineers. A possible source of error is pointed out by W. J. Sharwood[1]. The tellurium test requires that the particles be moistened with the strongest sulphuric acid and heated nearly to white fumes, as the tellurium color forms only in a narrow temperature range. Several specimens containing no tellurium, but only manganese peroxide, gave a fine purple color on being treated with strong sulphuric acid, after standing a few minutes. The color could usually be brought out by breathing on the sample while it was cooling, and was apparently due to formation of permanganic acid.

The test fails in the presence of large amounts of sulphides, and is useless with oxidized compounds unless they are previously reduced. G. T. Holloway[2] describes a method of isolating tellurium from ores for testing purposes by concentrating it with the gold and silver in a lead button by means of the ordinary fire assay. The lead button is then dissolved in nitric acid, the solution diluted, and the tellurium precipitated on lead foil, the deposit thus obtained being dried and tested by sulphuric acid.

[1] *Economic Geology*, Jan.-Feb., 1911.

[2] *Trans.* I. M. M., XVII, 175.

Conditions of Steel Works Employees

It should be noted that William B. Dickson, whose retirement from the vice-presidency of the Steel Corporation was recently reported, took a strong interest in the employees of the company, and in improving the conditions of their labor. His paper, read at the American Iron and Steel Institute's New York meeting, May, 1910, advocating the adoption of a plan whereby no individual workman should be on duty more than six consecutive days, helped to create sentiment for the six-day week, and resulted in the appointment of a committee of steel manufacturers to report on the subject. At the October, 1910, meeting of the institute he read a paper on the "Betterment of Labor Conditions in the Steel Industy," in which he described some of the work of the United States Steel Corporation in reducing seven-day labor to a minimum and in establishing accident relief and pension systems. These papers attracted much interest on account of Mr. Dickson's long experience in the management of works. He spoke not as an idealist, but as one who understood the practical and commercial sides of the question.

Copper Queen Power Costs

According to the report of Phelps, Dodge & Co., the central power plant at Bisbee used 8168.1 gal. of fuel oil per day in 1910, which raised 705,969.2 lb. of steam per day, or 86.5 lb. steam per gallon of oil. At the Douglas power plant a horsepower-year cost $72.20, made up as follows: Labor, $9.23; tools and supplies, $1.49; repairs, $7.72; fuel, $53.15; water, $0.61. It is stated that there was an average development of 3596 h.p. At this rate the total fuel should have cost $191,127. As 112,475 bbl. of fuel oil were used, this would bring the average cost of fuel oil per bbl. at about $1.70, which probably includes freight from the Kansas oilfields.

The distribution of power at the Douglas smeltery was: Blast-furnace blowing engines, 34.93 per cent.; converter blowing engines, 34.85; electrical power, 25.97; compressed air, 4.25 per cent.

Coal Mining Department

The Important News Of Coal Mining. New Appliances, New Methods. New Fields, Colliery Engineering

Labor at Bituminous Mines

WASHINGTON CORRESPONDENCE

The Immigration Commission has just published a review of the whole of its work on bituminous-coal mining. This matter has been made available to the public heretofore only in the form of detached treatment of separate coalfields, but the commission has now consolidated the separate conclusions. In summarizing its findings as to bituminous-coal mining it says:

The operating forces of the bituminous coal-mining industry were studied in Pennsylvania, Ohio, Indiana, Illinois, Kansas, Oklahoma, Arkansas, Alabama, Virginia and West Virginia. Detailed information was secured for 88,368 employees, and 2371 households the heads of which were engaged in bituminous mining were intensively studied. Of the total number of employees, 61.9 per cent. were of foreign birth, 9.5 per cent. were of native birth but foreign father, and 28.5 per cent. were native-born persons of native father. The principal races of old immigration were the Germans, with 2699 reporting, and the English, with 2497 reporting, while the Slovaks, with 11,318, the Poles, with 7370, and the North Italians, with 6666, were the races of recent immigration most largely represented. Only 20.7 per cent. of the foreign-born employees had had any experience in bituminous-coal mining before coming to this country, while 58 per cent. had been farmers or farm laborers abroad. The average daily wage of employees 18 years of age or over was $2.19, and of all males 18 years of age or over in the households studied the average annual earnings were $443. The average annual earnings of male heads of families who were employed in the industry were $451, and the average annual income of families the heads of which were working in the industry was $577. Slightly more than two-fifths, or 40.6 per cent., of the families studied derived their entire income from the earnings of husbands, while 35 per cent. were supported by the earnings of husbands and the payments of boarders or lodgers, and 7.8 per cent. by the earnings of husbands and the contributions of children.

About the same proportion of the employees 20 years of age or over in both nativity groups were married, the percentage in the case of the foreign-born being 67.3 and of the native-born 67.5. Only 82.9 per cent. of the employees of foreign birth were able to read and 80.9 per cent. able both to read and to write. Of the total number of foreign-born employees of non-English-speaking races, 61.2 per cent were able to speak English. Of the foreign-born employees 21 years of age or over who had been in the United States five years or more only 26.8 per cent. were naturalized, and 14.9 per cent. were in possession of first papers. Of the native-born males in the households studied 55.8 per cent., and of the foreign-born 31.8 per cent., were members of labor organizations.

The report upon this industry consists of five parts: (1) General survey of the industry as a whole, which consists of a statistical summary based upon the total number of employees and households studied; (2) survey of the industry in Pennsylvania, including an intensive study of two representative bituminous-coal mining communities; (3) a study of the industry in the Middle West; (4) a study of the industry in the Southwest; and (5) the industry in the South.

Indiana Coal Production

Indiana mines produced 18,125,244 tons of coal in 1910, according to the annual report of Mine Inspector James Epperson. The cost of producing that amount of coal, including the wages of miners, inside day men and outside day men, was $15,527,390.72. Accidents in mines resulted in 51 deaths; also 6 permanent and 505 serious injuries.

The report shows that the mines established a record for the amount of coal produced compared with the number of fatalities, only one death occurring for each 355,396 tons of coal mined. This is an increased tonnage of 81,555, as compared with last year, and according to Mr. Epperson, places Indiana far in the lead of other States in this respect.

Of the coal produced, the following tabulation is made: Hand-mined block coal, 640,946 tons; machine-mined block, 234,512 tons; total, 875,459; cost, $1,209,194.60. The bituminous coal produced was 17,249,785 tons, at a cost of $14,318,196.12. Of this amount 6,595,391 tons was hand mined and 10,653,854 machine mined. An average of 31 tons of coal was produced for every keg of powder used.

Explosion at Banner Mine in Alabama

A disastrous explosion occurred in the Banner mine of the Pratt Consolidated Coal Company at 6:35 on the morning of April 8, as noted in the JOURNAL of last week. The total death list is placed at 128. Of this number, only five were freemen, viz., two white, and three negroes. Of the 123 convicts only 12 were white. Rescuers headed by Doctor Rutledge, engineer with the Bureau of Mines, had a narrow escape from death and were brought from the mine in an unconscious condition.

The exact cause of the explosion has not yet been determined. There are indications that the trouble may have originated in the seventh left entry, where the mine is badly damaged and in which section the bodies of the victims were mangled. It appears that in other parts of the mine, the men were killed by afterdamp rather than by the explosion itself.

While the loss of life is the greatest in the history of Alabama coal mining, the damage to the mine is estimated to be very small. The principal damage was to the fan at the new shaft, and also to brattices and overcasts in that part of the mine where the explosion occurred.

As is so often the case, the Banner mine was supposed to be one of the safest and best equipped mines in Alabama. Careful attention was devoted to sprinkling the mine, and the Pratt officials considered the system here used as an example of the best modern practice. Moisture was supplied to the air circulating in the mine by means of spraying. Erskine Ramsay, chief engineer of the Pratt Consolidated Company, recently estimated that the 31 sprays that were installed in the Banner mine would deliver about 30 gal. per hour each, and with all of the sprays working, a total of over 22,000 gal. would be delivered during each 24 hours.

The Banner mine began operating in the fall of 1904; the seam being developed is known as the "Big Seam" and averages about 9 ft. in thickness. The daily output of the mine is from 1200 to 1500 tons. The coal runs about 30 per cent. volatile matter.

All of the coal is undercut before being shot down. Rooms vary from 30 to 40 ft. in width. The particular danger in the Banner mine has always been due to the extensive amount of dust that is made, caused by the friable nature of the coal. It was the practice at this mine to load out all of the fine coal and in this way reduce the quantity of dust to a minimum. The mine itself gives off some gas, but not in dangerous quantities. Naked lights were used by the miners.

U of M

Friction of Air in Mines

By F. Ernest Brackett*

A technical discussion of the conclusions of several experimenters, who have investigated the friction of air currents in mines. Much confusion has been caused by the divergent results obtained.

*Mining engineer, Cumberland, Md.

There are a number of figures relating to engineering data, which by reason of the want of information concerning related circumstances, become nearly useless for any practical purpose. Such figures are often still further obscured by the fact that different experimenters working under different conditions, arrive at entirely divergent results.

The coefficient of friction of air currents in mines is one of these figures. The results obtained by different experimenters vary so entirely that it seems impossible to select from among the various given values one which will answer the purpose for a particular case. This confusion has still further been increased by the fact that our schools and textbooks, for purposes of instruction, usually select Atkinson's coefficient. Perhaps Atkinson's work was the first in the mining field, or perhaps his work is taken because the value given is about the highest on record, and is, therefore, safe. At any rate, the average engineer after comparing the results of Atkinson's formula with his own practical knowledge of ventilation, usually gives up the formula, and contents himself with determining by experiment the water gage at mines of about the same size as his own. Although this method undoubtedly has the advantage of being practical, still the formula should give the required result more quickly and more accurately.

As is well known by most engineers, the real trouble with Atkinson's formula, which is only another form of a well known hydraulic formula, arises from the fact that the constant—so called, in the theory by which the formula is derived—is not in reality a constant. In fact the subject of hydrodynamics is largely occupied with deriving empirical methods of finding the value of this constant corresponding with different circumstances. The present work was undertaken with a view of putting this matter in at least some kind of order insofar as the ventilation of mines is concerned.

The formula adopted by Atkinson is,

$$p = \frac{k s v^2}{a},$$

when p is pressure in pounds per square foot; s is surface rubbed in square feet; v is velocity in feet per minute; a is area of section in square feet and k the constant.

TABLE NO. 1. EXPERIMENTS OF M. D. MURGUE.

No. of experiment.	1	2	3	4	5	6	7	8	9	10	11	12
Kind of heading..	Bare Sides Driven in Rock				Arched with Stone					Timbered and lagged. Two legs and one cap. Sets 1.2 m. center to center per set.		
Rough or smooth.	Smooth	Smooth	Smooth near a turn	Rough	Sides wet	Dry and sharp	Similar to 5	.....	.....	Timber slightly irregular	Properly timbered	Well timbered
Form.....	Straight	Straight	Straight	Straight	Straight	Straight	Curved in half circle	Sinuous	Sinuous	straight	Straight	Sinuous
Length, L.....	93.87	76.35	94.70	75.20	110.90	330.66	102.12	92.10	61.30	97.08	80.25	92.53
Section, s.....	3.5839	4.1300	5.8164	2.0217	3.4474	3.6079	3.4561	2.7364	2.1247	3.0371	3.3372	2.0853
Perimeter, p.....	7.40	8.02	9.77	5.39	7.02	7.18	7.02	6.26	5.67	6.91	7.23	5.77
Mean rad., R.....	0.4843	0.5150	0.5952	0.3751	0.4911	0.5025	0.4923	0.4371	0.3747	.4401	0.4616	0.3614
$\alpha \times 10^3 =$	0.917	0.863	1.045	1.219	0.305	0.365	0.617	0.512	0.547	1.680	1.437	2.380
$c \times 10^3 =$	0.700	0.674	0.861	0.845	0.234	0.282	0.473	0.376	0.379	1.238	1.076	1.628
Averages.....	0.770				0.258		0.378			1.157		

Remarks on Table No. 1. These headings were not obstructed by tracks. The values given for α and c have been reduced to correspond to an atmospheric weight of 1.2 kg. per cu.m. On timbered headings the sections were measured inside the timber.

Murgue's Experiments

About the year 1892, M. D. Murgue, engineer of the Bessèges collieries, France, made a series of twelve experiments in the Créal and Bessèges mines to determine in more detail the friction of air currents in mines. Mr. Murgue used the same formula as that used by Atkinson with the exception that he introduced the density of the air into the calculation by introducing the factor $\frac{\delta}{\delta_o}$ where δ is the actual weight of the air in the mine in kilograms per cubic meter, and δ_o a standard weight which he fixes at 1.2 kg. If this refinement is not deemed advisable the factor can be omitted entirely. Murgue's formula is $h = \alpha \frac{L p v^2 \delta}{s \delta_o}$ where h = the pressure in millimeters of water, L the length of the gallery, p the mean permieter, both in meters, v the velocity in meters per second and s the mean sectional area in square meters. The term $\frac{\delta}{\delta_o}$ we here choose to neglect as the refinement seems too small in proportion to other disturbing elements to be taken into account. We consider the weight of air to be 1.2 kg. per cubic meter, and all results hereafter detailed have been reduced to that standard. The relation between Atkinson's k and Murgues α being simply due to the difference between the English and metric units is found to be

$$k = \frac{0.5283\,\alpha}{10^5}.$$

Hereafter except as stated, the metric units are to be understood.

In 1884-85, M. Althans, president of the Sub Commission on Ventilators of the Prussian Firedamp Commission, undertook some experiments on the loss of pressure in air passing through cast-iron pipes. In order to make the matter more complete, the works of Deviellez and Arson were also examined. The formula derived by M. Althans from this work is

$$h = \frac{a L y^{\frac{3}{2}} u^2}{D^{1.373}},$$

where h is the loss in pressure in mm. of water; y the weight in kilograms of a cubic meter of air, u the mean velocity of the air in meters per second and D the diameter of the tube in meters. In the above formula, a is a constant $= \frac{748}{10^6}$ The ground covered by this formula ranged in round numbers from $u = 1$ to $u = 28$; from $y = 1$ to $y = 6.5$; from $L = 8$ to $L = 1000$ and from $D = 0.07$ to $D = 0.40$. As a whole the results were good except when u approached the value of about 1 m. per second.

It will be found by comparing Althans' formula with that of Murgue, after re-

ducing for round section, that there is no essential difference in the form of the two equations except in the exponent of D— the fractional exponent of $y(=\delta)$ is too near unity to have much effect on a term always so near unity.

Mr. Murgue in commenting on his experiments remarks that the sectional area of the gallery undoubtedly has some effect on the value of α as well as the roughness of the sides and curvature of the heading. There are thus at least three main factors in determining the value of α; the effect of the section, the effect of the nature of the sides and the effect of curves. Now Mr. Murgue's experiments cover all three of these fields fairly well, but do not cover them so completely that the effect of the sectional area can be considered separately. Mr. Althans' work does, however, cover the law of sections over a wide range, when one considers the ratio of the smallest to the greatest section, but does not discuss the effect of the nature of the side except for cast-iron pipe. It therefore naturally occurs to one that if the effect of the section could be eliminated from Murgue's work by the aid of the Althans'

TABLE NO. 2. EXPERIMENTS ON VENTILATION.

	Values for $c\times10^3$		
	Mean.	Smooth	Rough.
Arched headings—			
Straight	0.258	0.234	0.282
Sinuous	0.378	0.376	0.379
Curved	[0.521]	0.473	.....
Bare headings—Straight	0.770	0.674	0.861
Sinuous	[1.109]	.....	.....
Curved	[1.555]	.....	.....
Timbered headings—			
Straight	1.157	1.076	1.238
Sinuous	1.628	.....	.....
Curved	[2.337]	.....	.....

formula the effect of the nature of the sides and of curvatures might be classified and the whole matter to some extent put in order.

A Law that Is Sufficiently Exact

Before proceeding, however, perhaps some remarks should be made about another matter which to a certain extent disturbs the value of α. In the First place Althans' formula gives values of h much too low at low velocities. This might be obviated by changing the value of a for low velocities, or by introducing another term containing the first power of u into the equation, or by altering the exponent of u. Murgue found that the exponent v for his work was more exactly 1.9267 but was unwilling to adopt this figure in his formula as he considered 2 sufficiently exact and more easily handled. We think, therefore, that while the law of the square of velocities certainly does not hold good over wide ranges of velocities it is sufficiently exact for use in mine ventilation.

Comparison of Formulas

In order to compare Murgue's work on irregular sections with Althans' work on round sections it seems proper for certain hydrodynamic reasons to reduce both formulas into terms of the mean radius. If R be the mean radius then Murgue's formula becomes $h=\frac{\alpha L v^2}{R}$, and Althans' formula becomes $h=\frac{cLu^2}{R^{1.373}}$. In the latter case c is a new constant which contains all the old constants appearing after conversion. By combination, the value of c in terms of α is found to be

$$\alpha=\frac{c}{R^{0.373}}.$$

As c was found by Althans to be independent of D we can fairly assume that it depends only on the nature of the sides and curvatures of the headings. Table No. 1 gives an outline of M. Murgue's work and the computed values of c for each experiment. It will be noted that with the effect of the section eliminated, it is possible to arrange the values of c according to Table No. 2. In the latter table the values shown in brackets have been interpolated for the sake of completeness of the table. Thus as experiments 5 and 7 are on headings similar except for curvatures, the ratio

$$\frac{0.473}{0.234}=2.02$$

is assumed to be the factor of increase in c between straight and curved headings. Also the ratios

$$\frac{0.378}{0.258}=1.47 \text{ and } \frac{1.628}{1.157}=1.41,$$

averaging 1.44 are considered as giving the relation between straight and sinuous headings.

In order to make practical use of these results, the combined formula

$$h=\frac{c}{R^{0.373}}\frac{Lpv^2}{s}=\frac{cLv^2}{R^{1.373}}$$

can be used. However, as the exponent of R makes this tedious, and as most readers of this article will probably be still further inconvenienced by the metric measures used, the following table (No. 3) has been prepared. Table No. 3 gives the value of α for Murgue's formula and the corresponding value of k for Atkinson's formula for metric values of $c\times10^3$, varying from 0.20 to 2.60 and for metric values of R corresponding to 6 in., 1 ft., 2 ft. and 3 ft. The table is, therefore, available for use either for the metric or English measures. The values given of c correspond, of course, to the metric system, but by reason of this arrangement, their use in determining either Murgue's α or Atkinson's, k is obvious.

TABLE NO. 3.

			$R=$ 0.152 m. 0.5 ft.	$R=$ 0.305 m. 1 ft.	$R=$ 0.610 m. 2 ft.	$R=$ 0.914 m. 3 ft.
$c\times10^3=$	0.20	$\alpha\times10^3=$	0.404	0.312	0.241	0.207
		$k\times10^8=$	0.213	0.165	0.127	0.109
$c\times10^3=$	0.40	$\alpha\times10^3=$	0.808	0.623	0.481	0.414
		$k\times10^8=$	0.427	0.329	0.254	0.219
$c\times10^3=$	0.60	$\alpha\times10^3=$	1.212	0.935	0.722	0.620
		$k\times10^8=$	0.640	0.494	0.381	0.328
$c\times10^3=$	0.80	$\alpha\times10^3=$	1.616	1.246	0.963	0.827
		$k\times10^8=$	0.854	0.658	0.509	0.437
$c\times10^3=$	1.00	$\alpha\times10^3=$	2.020	1.558	1.203	1.034
		$k\times10^8=$	1.067	0.823	0.636	0.546
$c\times10^3=$	1.20	$\alpha\times10^3=$	2.424	1.869	1.444	1.241
		$k\times10^8=$	1.281	0.787	0.763	0.656
$c\times10^3=$	1.40	$\alpha\times10^3=$	2.828	2.181	1.685	1.448
		$k\times10^8=$	1.494	1.152	0.890	0.765
$c\times10^3=$	1.60	$\alpha\times30^3=$	3.232	2.492	1.925	1.655
		$k\times10^8=$	1.707	1.316	1.017	0.874
$c\times10^3=$	1.80	$\alpha\times10^3=$	3.636	2.804	2.166	1.861
		$k\times10^8=$	1.921	1.481	1.144	0.983
$c\times10^3=$	2.00	$\alpha\times10^3=$	4.040	3.115	2.407	2.068
		$k\times10^8=$	2.134	1.646	1.272	1.092
$c\times10^3=$	2.20	$\alpha\times10^3=$	4.444	3.427	2.647	2.275
		$k\times10^8=$	2.348	1.810	1.399	1.202
$c\times10^3=$	2.40	$\alpha\times10^3=$	4.849	3.738	2.888	2.482
		$k\times10^8=$	2.562	1.975	1.526	1.311
$c\times10^3=$	2.60	$\alpha\times10^3=$	5.253	4.050	3.129	2.689
		$k\times10^8=$	2.775	2.140	1.653	1.421

A General Value for Constants

While the above tables seem to give a more satisfactory classification of the values of α and k than any work which has come to the writer's notice, there still remains the question of a general value for these constants, which could be used uniformly through a given mine to find the total ventilating pressure. M. Murgue's remarks that the general average for mines, such as he experimented with, would hardly go so high as the value $\alpha=0.0018$, which value was assigned by Deriellez, although Mr. Murgue thinks his experiments confirm this value approximately. As the normal value of R in Murgue's mines was about 0.5 of a meter, the average value of $c\times10^3$

was somewhat less than 1.40, according to his ideas.

From an observation I made in a coal mine, where the value of the mean radius was 2.3 ft., k was found to have a value of $0.613 \div 10^8$, which would place the (metric) value of $c \times 10^3$ close to 1. Under similar conditions, however, the value of k has gone as low as $0.41 \div 10^8$, although there was probably more leakage through old workings, and brattices, in this latter case than there was in the first case.

As far as my general experience goes, it would seem that the value $k = 0.5 \div 10^8$ is usually sufficient in coal mines working from 6 to 8 ft. of coal in horizontal beds. Although if there were no leakings this would undoubtedly be too low.

Judging from the numerous determinations of different writers on the subject, however, it would seem that the most usual values of k is about $0.85 \div 10^8$, a result which is quite in harmony with M. Murgue's ideas, though doubtless the theoretical conditions of no leakage are here supposed.

At any rate, the determination of Atkinson $\left(k = \frac{2.17}{10^8}\right)$ and of Andre $\left(k = \frac{2.24}{10^8}\right)$ undoubtedly, are at least double any general value, which is likely to be encountered in coal-mine practice, and must represent a set of conditions, severe in the extreme.

Taxing Anthracite Coal

By P. M. Greer*

The Woodward bill, which is at present before the Pennsylvania legislature, provides for a tax of 2½ per cent. of the value of bituminous and anthracite coal at the mouth of the mine. It is backed by the Republican organization, and there is therefore every likelihood of the measure becoming law. The tax is to be a State tax and is to be applied to State purposes.

The bill has encountered a good deal of opposition, from men and interests that have but little sympathy with corporate coal interests. It is asserted by these people that if anthracite coal is to be taxed to the extent proposed in the bill, that a part, if not the entire amount, of revenue derived from the tax should be apportioned and disbursed in the anthracite regions for surface protection, hospitals, pensions for disabled miners, compensation for the widows of miners killed in the mines and other purposes of the kind. On the other hand, it is doubtful if such an exclusive appropriation would be constitutional if it were practicable. A general tax, such as is provided for in the Woodward bill, must be applied for general purposes. However, the objection raised to the bill by these people is eminently just and reasonable. Its fairness does not constitute its logical expediency in the eyes of the Republican party or the ring that dominates the Republican party in the Commonwealth of Pennsylvania.

I am not one of those who are antagonistic to a reasonable tax on coal. The anthracite industry is a natural monopoly, limited in extent, and is in the process of rapid exhaustion. The coal corporations and individual operators have had all the benefits of this precious mineral for generations without making an adequate or even an appreciative return either to the State or the localized communities for the vast wealth which they have derived from it. The money which these corporations and individual operators have disbursed in wages has not been the equivalent of the economic return which they received in work. It is also true that the corporations have been indifferent to the social progress of the people who have lived on the surface of the mines from which they have drawn their immense financial capital.

Bituminous Operators Favor Tax

On the other hand, an arbitrary and inconsiderate tax of this kind, which, although having a legislative sanction, can hardly be distinguished from graft, is bound to be injurious to every interest depending directly or indirectly on the production of anthracite coal. I am not concerned just now with the effect of the tax on the bituminous coal of Pennsylvania, for by the limitation of the production of the anthracite mines, or, in other words, by the increase in the price of anthracite, the bituminous mines will undoubtedly extend their domestic markets, as they are in the way of monopolizing the steam-coal markets that were formerly held by anthracite operators. The bituminous operators are not seriously contesting the tax in the lobby at Harrisburg, and considering their almost unqualified political influence in Pittsburg and around, there is probably some truth in the assertions of those who are fighting the tax on anthracite coal that the bituminous operators have instigated the legislation rather than opposed it.

Let us see then, first, the case made out by those who favor the tax, for they have a case, and in some respects a strong one. They say that coal *in situ* is worth about 40c. a ton. When the coal is at the mouth of the shaft, it may be taken that it is worth on an average $2.40 a ton. Royalties would increase the cost of production to $2.80 a ton as it stands at the mouth of the mine. This coal sells at tidewater at from $4.50 to $5. The coal operators are their own carriers and the difference between the selling price, say $4.50 on an average, and the cost of production, say half of that, makes up or contributes to the transportation charges and the interest on invested capital. Is there a sufficient margin of profit to the coal companies to justify a tax of 2½ per cent. on the approximate cost of the coal at the mines?

The Tax Will Fall on Consumer

The coal companies contend that their profits are not nearly what they are represented to be by those who wish to tax them out of existence. They assert that any increase in taxation that is imposed by the legislature must be met by the consumer, recognizing as they do that increased cost of production through taxation or higher wages or from any other cause that augments the price of coal, leads to a restricted demand, the infringement of bituminous on anthracite and consequently the depression of trade in the anthracite regions. I am merely presenting the case as each side presents it, the coal companies on the one hand, and those who favor the tax bill that is now before the Pennsylvania legislature on the other. One of the witnesses who was examined before the ways and means committee of the legislature a few days ago, stated that if the tax was imposed it should be expended in the localities from which it was derived; he said that it would be as reasonable to impose a tax on the farmers of Berks or Pike county for the benefit of Philadelphia, as it would be for the legislature to tax anthracite coal to alleviate the taxation for the benefit of the farmers of Berks or Pike county. That is true. The fact is there is not a State in the union which has a nobler revenue for its particular executive purposes than the commonwealth of Pennsylvania, and to increase it from a tax upon coal or any other industrial commodity would be merely the imposition of a tax to be ultimately dissipated in graft.

There is no question that a small tax on coal to meet such contingencies as mine fires, mine caves, hospitals and relief for widows and orphans would be a just and beneficent exercise of the taxation powers of the legislature. It is another matter when the money derived from such a comparatively heavy tax as 2½ per cent. on the estimated value of the coal produced and handled at the top of the mine, is to be appropriated to the general revenue of a State that has more money for its expenses than it can expend otherwise than by the invention of new offices for its absorption.

But the people are indifferent. Even the miners, who will be the most seriously affected by the new tax are silent. The officials of their union are more absorbed in endeavoring to have the State constabulary abolished or crippled than in issuing a protest against a tax that may perhaps seriously hamper the anthracite coal industry for a generation to come.

*Scranton, Penn.

Delaware, Lackawanna & Western

Besides its railroad lines between New York and Buffalo, this company owns a large estate in the anthracite region of Pennsylvania. It is one of the two anthracite carriers which have always operated their coal lands directly and not through a subsidiary company. It is also one of the companies which acquired its lands at low prices many years ago, and which has always made mining as well as carrying a profitable part of its business. In 1909, in order to conform with the commodities clause of the Interstate Commerce law, an arrangement was made by which all its coal, except that sold at the mines or taken for the use of the railroad, is sold at the mines to the Delaware, Lackawanna & Western Coal Company, organized for the purpose, which takes charge of the shipment and sale of the coal. The latest report covers the year ended Dec. 31, 1910, the first full year under the new arrangement.

Coal Mined and Earnings

The coal statement for two years is as follows, in long tons:

	1909	1910	Changes
On hand Jan. 1	1,294,321	372,724	D. 921,597
Mined, washed and bought	9,644,309	9,720,198	I. 75,889
Total.....	10,938,630	10,092,922	D. 845,708
Sales:			
At mines....	85,616	80,298	D. 5,318
Railroad supply....	1,259,315	1,401,011	I. 141,696
Local agencies...	3,652,607	.....	D.3,652,607
Foreign agencies...	1,254,674	.....	D.1,254,674
D., L. & W. Coal Co....	4,313,694	8,435,528	I. 4,121,834
Total sales.	10,565,906	9,916,837	D. 649,069
Stock, Dec. 31.....	372,724	176,085	D. 196,639

In 1909 the company marketed its own coal up to July 31. From Aug. 1 the sales were transferred to the subsidiary coal company.

The earnings and expenses of the coal department in 1910 were as follow:

	Amounts	Per Ton
Coal sales at mines.....	$240,823	$3.00
Railroad supply coal.....	1,548,421	1.11
Sales to D., L. & W. Coal Co.....	19,888,582	2.36
Total sales.....	$21,677,826	$2.19
Coal-land rents.....	30,228	.....
Total earnings.....	$21,708,054	$2.19
Cost of coal mined and bought.....	$16,947,965	$1.74
Local handling, Scranton...	44,345	0.55
General expenses.....	127,143	0.01
Coal sold from stock.....	51,979	0.26
Taxes.....	480,165	0.05
Mine improvements.....	675,195	0.07
Total expenses.....	$18,326,972	$1.85
Net earnings.....	$3,381,262	$0.34

Averages for total earnings, expenses and net earnings are based on total coal sold. The other averages are calculated on tonnage of different items, as given in the coal statement. The total expenses were 84.4 per cent. of the gross earnings.

The report of the railroad shows that the coal carried during the year was 8,921,033 long tons. The average haul was 188 miles; the average earnings per ton carried were $1.58, and per ton-mile 0.837c. The average rate per ton-mile on coal was greater by 0.141c. than that on general freight. The earnings of the railroad from coal were $14,067,778, or 39 per cent. of its total receipts.

Coal-mining Operations

The mining operations of the company resulted in producing about 373,000 tons more coal than during the preceding year. The company's washeries produced about 102,000 tons less, and the purchases of coal from independent companies were about 195,000 tons less, so that the total amount produced and purchased aggregated 9,720,198 tons, as compared with 9,644,309 tons during the preceding year. The cost per ton of the coal produced was slightly more, chiefly due to the fact that each year an increasing amount of coal is mined from the thinner veins, or in territory more remote from the mining shafts. The company's production of coal during the last year includes 526,710 tons mined from old abandoned workings, which coal has heretofore, for one reason or another, been considered unworkable and lost. All of this coal has been secured at a moderate cost. Shortly before the close of the year certain veins in the company's Avondale colliery were flooded, temporarily curtailing the operations of that mine until provision can be made for a pumping plant that will take care of the increased flow of water into the mine.

Changes and Improvements

The company's mining properties have been fully maintained and in addition substantial improvements have been made, which aggregated the sum of $675,195. Among other items these include the cost of modern boiler plants at Auchincloss and Bliss collieries; installations and important extensions of underground electric-trolley lines, electrical appliances for pumping, haulage, etc.; pumps; installation of new 2000-kw. generator at Hampton central power plant; a large number of electric locomotives for mine haulage; additional ventilating plants, etc. They also include the sum of $104,172 expended in the sinking of new shafts and other development work in connection with the new Loomis colliery; also the sum of $58,395 for the construction of new concrete breaker and washery building at Taylor colliery.

In further pursuance of the policy of the company in such matters, the sum of $302,420 was expended in the purchase of all the rights and claims of owners in certain old royalty leases held by the company on coal lands, under which it had the right to mine coal from certain lands at a fixed price per ton. In most cases the consideration paid for these purchases covers settlement of claims of the lessors for substantial sums growing out of the wording or terms of these old leases which in many cases finally get into litigation, the results of which are always uncertain and often unsatisfactory. The friendly relations heretofore existing between the company and its mine employees have been continued throughout the last year, thus completing a total of eight years during which not a single case of difference has arisen between them which has been referred to the Conciliation Board for arbitration.

Mine Explosion in Kansas

The investigations to determine the responsibility for the series of explosions that wrecked the Missouri, Kansas & Texas Railroad Company's mine at Mineral, Kan., have brought to light many interesting facts. The accident occurred March 18, and resulted in the death of five miners. The testimony introduced tends to show that the mine officials did not exercise proper precautions in protecting the lives of their employees. The law specifies that when the entries of a mine are approaching any abandoned workings, a series of holes must be drilled at least 12 ft. in advance of the coal face where the men are working. The company's excuse was that the figures pertaining to the exact location of the abandoned workings had been lost, and in view of that fact it should not be held responsible.

The accident was directly due to shots that were exploded by two of the victims. The concussions from these shots blew a large hole through the thin pillar between the two mines. It is thought that when the old workings were encountered, pent-up gas was let loose and caused the explosion.

Mr. Gilday, chief State mine inspector, will attach the result of his investigation to his biennial report; his decision relative to fixing the responsibility for the accident will not be known until this report is issued.

Damage suits are already being filed against the company, by relatives of the miners who lost their lives. The petitions in the suits allege negligence on several counts, and the petitions particularly specify that the company disobeyed the law in not boring ahead into the face of an entry in order to anticipate danger.

A test for blasting caps is given in Heyse's book "Explosives." The caps are set upright on a ½-in. sheet of lead, and ignited with a Bickford fuse. From the size of the hole, and the force with which the fragments of the cap are driven in, an idea can be obtained of the strength of the caps.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

S. F. Shaw is in London, England, on professional business.

Henry F. Lefevre has returned to New York after an absence of two months in Central America.

Morril B. Spaulding has left New York to make some extended mine examinations in California.

Sir Brian Leighton, of London, England, has been looking over claims at Porcupine, Ontario.

William Young Westervelt has removed his office to the Pullman building, 17 Madison Square east, New York.

Robert Musgrave, of Mexico City, formerly manager of El Tigre mine, went to Victoria, B. C., early in April.

Charles M. Rolker is going to make an examination of the properties of the Russian Mining Corporation in Siberia.

Edward K. Judd left New York, April 14, for a professional trip to northern Nevada, to be gone about two weeks.

R. G. Hall, general manager of the United Zinc Company, has been visiting the Tajo mine at Parral, Chihuahua, Mexico.

W. S. Keith has returned from an examination trip to the Noble mines, in Pine Valley, San Diego county, California.

C. B. Naremore has resigned from the U. S. Geological Survey to accept a position with the Associated Oil Company of California.

Mark R. Lamb has been appointed manager of the South American branch of the Allis-Chalmers Company, with office in Santiago, Chile.

J. M. Ruffner, manager of the North Columbia Gold Mining Company, has returned to Atlin, B. C., from Cincinnati, where he spent the winter.

Eugene McSweeney, of Saginaw, Mich., president of the United States Graphite Company, is visiting the company's mines at La Lapiz, Sonora, Mexico.

F. H. Hillman, recently manager for the Standard Oil Company in Illinois, has been transferred to California, and has established headquarters at Bakersfield.

C. C. Rasch and Walter Harvey Weed have been visiting the Transvaal mines, near Cumpas, Sonora, Mexico, in connection with proposed exploration work.

G. W. Thompson, of the Temiskaming Mining Company, Cobalt, has been appointed general manager of the Pearl Lake Gold Mining Company, Porcupine, Ontario

W. J. Elmendorf, manager of the Portland Canal Mining Company, has returned to Portland Canal, B. C., after having been in Spokane and Seattle, Wash., during part of the winter.

John Knox, Jr., for the past three years in charge of the underground work for the Calumet & Hecla, has been appointed general superintendent for the Calumet & Hecla and subsidiary companies.

Forest Rutherford, assistant superintendent of the Copper Queen smelting works at Douglas, Ariz., is reported to have been wounded in the foot by a stray shot in the recent battle of Agua Prieta.

Fredrick Winslow Taylor, of Philadelphia will make an address on "The New Conception of Business and Industrial Efficiency," in Carnegie Hall, New York, April 28, under the auspices of the Civic Forum.

Edward R. Haggin, formerly with the Compañia Minera y Exploradora de Ventanas, has taken charge metallurgically of the reduction plant of the Candelaria Consolidated Mexican Mining Company, at San Dimas, Durango, Mexico.

Francis J. Webb, for some time superintendent of the Republic Iron and Steel Company's mines, at Gilbert, Minn., has been appointed general manager for the company's mines in Michigan and Minnesota with headquarters in Duluth.

Charles D. Wilkinson, who has for several years been one of the consulting engineers for the George Wingfield interests, with headquarters in Goldfield, Nev., has resigned and will hereafter devote a large part of his time to his personal mining interests.

Fredrick B. Irvine has resigned as general manager of the Buena Fé Mining Company, Ojuelos, Jalisco, Mexico, and sailed for Haiti, April 15, with the expedition of the Carribean Construction Company. He will be at St. Marc, Haiti, for several months, Clyde W. Smith, formerly at the Nueva Luz, Guanajuato, is now in charge of the Buena Fé mine.

OBITUARY

Charles W. Goodyear died at Buffalo, N. Y., April 16, aged 64 years. He was born at Cortlandt, N. Y., educated as a lawyer and practiced law for a number of years. For nearly 20 years past, however, he was engaged in the development of coal and lumber interests in western Pennsylvania. He was president of the Buffalo & Susquehanna Coal Company and was interested in several other coal companies.

Louis Joseph Forget, of Montreal, died April 7, at Nice, France, where he had gone on account of his health. He was 58 years old, and was born in Quebec. He was largely interested in mining in Quebec and Nova Scotia; he was vice-president of the Dominion Steel Corporation, and a director of several other companies. He was active in Canadian politics and was a member of the Senate of the Dominion.

Thomas D. Murphy was killed by a Mexican miner at El Favor mine in the Hostotipaquillo district, April 3. He was 43 years old, was born in Ontario and graduated from the University of California. After some years spent in mining in Montana, Colorado, Utah and Arizona, he went to Mexico, where he was engaged at a number of mines. He was four years with El Oro Mining Company, and then went to Costa Rica for two years. On his return to Mexico he was made manager of El Favor mines, and held that position at the time of his death.

Nicholas J. Cavanaugh, who died in Vancouver, B. C., recently, at the age of 46 years, was born at Appleton, Wis. When quite a young man he joined the office staff of one of the large iron mines at Mountain Iron, Minn.; ever since which time he has been actively connected with mining. In the nineties, he went to the Slocan district of British Columbia. In 1898 he joined the staff of the Byron N. White Company, owning the Slocan Star group of mines, and he remained in charge of the company's office at Sandon, B. C., until 1906, in which year he removed to Nelson. For some time afterward he was associated with James Cronin, formerly part owner and manager of the St. Eugene lead-silver mine in East Kootenay, in operating under a working bond, the Queen Victoria copper mine, near Nelson, but when the price of copper fell the bond was relinquished. Since then he has been engaged in the mining brokerage business, first in Nelson and for the last year in Vancouver.

SOCIETIES and TECHNICAL SCHOOLS

Michigan College of Mines—The class-day exercises of the class of 1911 were held at Houghton, Mich., April 20. The address to the graduates was delivered by William L. Saunders, president of the Ingersool-Rand Company.

Missouri School of Mines—Hon. Joseph Jaffa, of Denver, Colo., gave 10 lectures on "American Mining Law" at this school at Rolla, Mo., from March 20 to March 25. Dr. E. R. Buckley addressed the Mining Club of the school on March 28, on "Importance of Geology to Mining Engineers."

Queen's University—Contracts for the erection of the Nicol metallurgy building in connection with this university, Kingston, Ont., have been let. The completion and equipment of the building will bring the total cost up to $55,000. Some two years since Prof. Wm. Nicol gave $40,000 for the erection of the building, but this amount was found inadequate and had to the suplemented by appealing to the graduates for subscriptions.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

April 14—Dr. C. Howard Merritt was, on April 10, sentenced in the Superior court of Alameda county to six months in the county jail and to pay a fine of $1000 upon conviction of circulating a false and misleading prospectus through which stock in the Haiwee Pacific Oil Company was sold. The defendant gave notice of appeal to the Appellate court.

The practical effect of the Smith remedial oil-land law, enacted by the last Congress, has just been demonstrated in a transaction in the Midway field in Kern county, by which a final payment of $112,000 was made by the Alaska Pioneers Oil Company for the south half of the south half of Sec. 32 T 31 R 23. The agreement for purchase was rested on the securing of patent by the vendors, which was interrupted by the Yard decision. The prompt action of the U. S. Land Office following the enactment of the Smith law, enabled the vendors to secure the patent within two weeks after the passage of the law and its signature by the President. The publicity given this transaction will effect a greater confidence in the efficacy of this remedial legislation than all other talk before or after the enactment that has been made, as it demonstrates the purview of the law, and establishes a precedent of positive importance to holders of oil lands whose application for patent have likewise been held up by the Yard decision. The vendors in this transaction were known as the Eight Oil Company, composed of Bakersfield and Los Angeles operators.

The recent orders received by the hull division officer at Mare Island from the Secretary of the Navy to be prepared with the proper equipment for the installation of oil burners in naval vessels on short notice, and the immediate installing of oil-burning furnaces in the tug "Navajo" are taken as intimating the purpose of the Navy Department to either equip the Pacific fleet with oil burners or substitute new oil-burning vessels for the present coal burners. Practically coincident with this activity at Mare Island navy yard the memorial of the State mineralogist and a large number of petroleum producers has been forwarded to the Secretary of the Navy urging expedition in the equipment of the Pacific fleet. The memorial presents a comparison of costs of coal fuel and oil fuel on this coast, based on the 1910 report of the paymaster-general of the Navy. The cost of coal per ton including transportation in foreign bottoms: at Puget Sound, $7.95; Honolulu, $7.70; Mare Island, $8.04. For deliveries in American bottoms the cost was greater by 11 per cent. to 25 per cent. The cost per bbl. of California oil fuel, including freights and handling; at Puget Sound, 90c.; Honolulu, 1.20; Mare Island, 80c. Estimating 3½ bbl. of oil to equal in efficiency one ton of coal, the saving to the United States Navy by the substitution of oil fuel on this coast for 1910 would have been 53.5 per cent. and amounted to $1,000,000. The fear expressed to the writer a few months ago by an officer at Mare Island that the Department might be confronted with a monopoly of the fuel-oil supply by corporations that could place the price at a prohibitive figure seems to have been either unfounded or recently dispelled. It is not unlikely that the policy of leasing oil lands by the Government as advocated by the President has had an influence upon the Navy Department.

Butte

April 14—The Amalgamated Copper Company has now practically concluded the merging of all its Butte properties into the Anaconda Copper Mining Company, and is about ready to work its mines on the cheapest possible basis.

Denver

April 16—A reduction of what amounts to about 10 per cent. on all classes of ore has been made in treatment charges at Cripple Creek by the United Reduction and Refining Company, as it is out with an announcement that it will at once put into effect a rate of $6.50 on ore up to 3 oz. gold per ton and $7 on ore yielding in excess of 3 oz. Probably the other big mills will meet the cut, and it will be a great boon to the whole camp.

The bill introduced by Senator B. J. O'Connell, of Georgetown, impowering the State to regulate smelting and reduction companies, passed the Senate on second reading. If the measure passes both houses and is approved by the Governor, it will be submitted to a vote of the people at the next general election. The Van Tilborg bill providing for the creation of drainage districts in the mining counties was read in the Senate today. This latter is a good measure and the mining associations of the State are said to be in favor of it. The former is meddlesome, unnecessary and harmful to the mining interests of the State, and should be killed.

Duluth

April 16—The inspector of mines for St. Louis county has rendered a report on the accident which took place not long since at the Norman pit, near Virginia. Mr. Harvey, in his report, says that the bank which caused the accident did not overhang or topple over, but that it slid out from the bottom at the point where the men were working, and that the frost undoubtedly started it moving. His opinion is, that the accident was unavoidable and not due to carelessness.

Within the next 10 days it is expected that the first shipment of ore from the Cuyuna range will be shipped from the Kennedy mine, and placed in the pockets of the new Soo dock, at Superior. The cars have already been ordered onto the mine spur. This shipment will mark the real opening of the Cuyuna range, and in a way is unique. Everything is new and results will be carefully watched. To begin with, it is the first shipment the mine will have made and the only one ever made from this range. The Soo line, over which the ore will be hauled, was built into the range especially for the ore traffic, and the new docks at Superior were recently completed for this purpose also. A celebration is being planned for the occasion.

New exploration work on the Vermilion range is now awaiting the spring breakup. Lake transportation, via Vermilion lake, is the only means of travel by which a number of properties now undergoing development can at present be reached. The ice on the lake is now insufficient to stand heavy traffic. Everything points toward the busiest summer this range has ever experienced. To one who has not visited the range, it is hard to understand the amount of work that is being done, and that is planned for the coming summer. Personal inspection impresses one with the possibilities of this range as nothing else can.

Indianapolis

April 15—The operators and owners of coal mines in Indiana are preparing to comply with the Aiken bill, which is soon to become a law. It provides for the preparation of maps of all mines in Indiana, showing location, shafts, opening, equipment, etc. These maps must be deposited with the State mine inspec-

tor and they must be revised and kept uptodate from time to time. In case of refusal or neglect to make the map, it shall be made under the supervision of the State mine inspector and the expense assessed against the operator.

To organize the coalfields where miners are not members of the United Mine Workers of America will be part of the work which the organization, under the leadership of President J. C. White, will advance during the new administration.

Another important matter with which the new administration will deal during the first year is the revival of the interstate agreement plan of settling wage disputes. Under the present arrangement each State settles its own differences and makes its own contracts between miners and operators. Formerly an interstate agreement plan provided that such settlements should be made between the miners and operators of Western Pennsylvania, Ohio, Indiana and Illinois. President White is now of the opinion that the question of resuming the interstate agreement plan is one which will have to be worked out during his administration. He said there is a possibility of the organization resuming that plan by a vote of the next national convention.

One of the first things done by the new executive board was to rescind the order whereby former President Lewis called 8000 men out in Pennsylvania and Ohio, where trouble has been evident between the miners and operators for a year or more. The new board held there had been no violation of contracts in the districts called out "sympathetically" by the former president.

Cobalt

April 14—The continued soft weather has rendered the trails almost impassable, and freighting into Porcupine and Gowganda districts is at an end. Gowganda and Elk Lake will be practically isolated until the ice leaves the Montreal river, and the boats are able to run. Porcupine will also be isolated, and even during the summer until the railroad is completed, conditions will be bad.

The trading in Porcupine shares indicates that the boom has hardly yet started, although it received a severe but healthy check during the past week. There has been a scramble on the part of brokers and the public to underwrite new flotations, and in the majority of cases an equally great scramble to get rid of them at a profit. At the present time the market is glutted with stock and new flotations are coming out daily. In this connection it is interesting to note that Cobalt mines are paying out more in dividends than ever before in the history of the camp, and are selling on the basis of 20 per cent. returns and are yet being neglected in favor of Porcupine prospects, many of them of extremely doubtful value. An interesting issue has lately been floated in London, namely, the Northern Exploration Company, put out by Bewick, Moreing & Co. The capital is £400.000, of which £100,000 has been issued in London. The company owns 50,000 shares in the Hollinger, and has an option on another 50,000 and it also owns 52 per cent. of the 50 claims bought from the Timmins syndicate. This company will supply capital to the subsidiary companies that are to develop the present holdings and others that may be acquired.

The great interest taken in the new gold districts of Northern Ontario has, to a great extent, drawn attention away from Cobalt, but notwithstanding this, the coming season promises to be one of considerable expansion. The limits of the silver-bearing area are by this time fairly well defined, and although careful prospecting will perhaps widen the field to some extent, this enlargement will be small. Operators are realizing, however, that the same ground may be gone over several times, and that this careful work is necessary before the ground can be considered thoroughly prospected. The Nipissing company, which owns the largest average of any property in the district, is so convinced that even with the most systematic trenching, many veins may be missed, that it has decided to clear the overburden from part of the holdings by hydraulic methods. By this means it will be impossible to miss any of the small veins and the work, though expensive, is expected to give excellent results.

During the last few months the mines have suffered from a shortage of power and as a consequence shipments have been largely curtailed. The winter has been unusually severe and has been marked by an absence of thaws, so that the water in the rivers has been exceedingly low. The companies supplying compressed air have been unable to operate their plants, so that the mines have had to fall back on their own compressors. In many cases the capacity of these plants has been outgrown, and the production has been smaller. Another factor that is partly responsible for the decreased tonnage is the large amount of silver being shipped in the form of bullion. Up to date for 1911, approximately 750,000 oz. of silver have been shipped in this form.

The coming season will also be marked by a more careful and systematic development of underground workings. The large number of veins that are found, which do not outcrop on the surface, makes this exploratory work of great importance, and as in many instances the oreshoots are short, the amount of dead work necessary before the ground can be thoroughly explored, is large. Although many new views will be found it is doubtful if the number of discoveries will equal that of last year.

During the first years of the camp, operations were almost exclusively confined to the larger and extremely rich orebodies, but as these are being gradually worked out, attention was necessarily turned to the lower-grade ores that are so easily capable of being concentrated. At the present time there are fourteen concentrators in operation in the district, while one is building and three others are projected. The proportion of concentrates in the shipments is constantly increasing.

It is probable that the production for 1911 will show a slight increase over last year, although the increase is not expected to be as great as in 1910. Dividend disbursements will probably show an increase also, as one or two of the smaller companies are entering the dividend-paying class and increases may be expected from some of the larger companies.

An agitation is again on foot to have the royalties that some of the companies pay to the Government reduced. All the companies pay 3 per cent. when their income is above a certain figure, but with several of the mines the granting of their titles was made conditional upon the payment of royalites, ranging from 10 to 25 per cent. of the gross proceeds, This is an exceedingly heavy and unjust handicap to work under, and it is felt that relief should be given by the Government.

Toronto

April 16—The Temiskaming & Northern Ontario Railway Commission has arranged to purchase for $250,000 the Nipissing Central Railway, an electric line running at present from Cobalt to Haileybury. In addition to the existing line the charter extends to New Liskeard and round the north end of Lake Nipissing to the Quebec border. The purchase carries with it control of the water power at High falls, and is regarded as a step toward the electrification of the entire system, which has been for some time in contemplation. The development of power for railway operations will be a great aid to the mining industry.

Exploration work is being conducted on several iron deposits situated west of the Metagami river and, 60 miles to the north of Porcupine. Among those actively interested are Senator Flynn, of Pittsburg, and Rinaldo McConnell, of Ottawa. Julius Metzer is manager of a holding in which Sudbury people are concerned. Drilling and shaft sinking are going on and examination shows that the iron runs over 58 per cent. pure and is low in sulphur and phosphorus. The only question remaining to be determined is that of the depth and extent of the deposits.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

Alaska Treadwell—The returns for the month ended March 15 are crushed, 34,832 tons; estimated gross value $83,642, net operating profit $486. Construction expense $40,171; yield per ton $2.40; development 888 feet.

O. S. Mining—This company has just begun pumping out the workings on 15 below Dome. This new company will have a good face ready to start upon, and will begin hoisting ore immediately.

Beatson—A large reduction plant is to be installed at this mine on Latouche island. Machinery for the concentrator has been delivered and will be installed as soon as possible. This mine is owned by the Guggenheim interests.

Williams-Gentzler—James Hall, Valdez, has taken an option on this property, which is showing some high-grade ore.

Gold Creek Hydraulic—This company will install new machinery on the property near Mineral creek. H. E. Ellis, Valdez, president.

Trinity Gold—This company has purchased claims of Mark Gleason, Valdez, and will start development work at once.

Guthrie & Bolloli—A five-stamp mill has been ordered for this property on Mineral creek.

Shaw, Lechner & Skeen—The claims on Falls creek have been bonded by Blain & Nelson, of Seward, who are planning a large amount of development work, and the installation of a stamp mill in the fall.

Arizona

Cochise County

Bisbee Extension—Detroit, Mich., interests have provided capital to continue sinking. The property is 12 miles west of Bisbee.

Gila County

Miami—Four cars of concentrate were shipped April 3. At the mine, 150 men have been added to the working force. It will be impossible for the mine to furnish enough ore for more than two units of the mill until after April 20, when the ore pocket on the 420-ft. level will be completed. In a recent test one of the units of the mill put through 755 tons of ore which is more than double the capacity that the unit was designed to treat. The fourth unit will be equipped with Burch rolls instead of the usual combination of rolls and chilean mills.

Inspiration—The company has begun grading a road from the property to the proposed site of the concentrating plant near Wheatfields, and the Arizona Eastern railroad has begun a preliminary survey for the spur to that section. There seems to be a belief that development will reveal a water supply not far east of the Inspiration, but no investigation of that territory's possibilities have as yet been made. Four drills are operating on the Inspiration ground.

Live Oak—Shaft No. 2 was started April 1 on the property. It will be sunk to 1200 ft. and will be two compartment. Shaft No. 2 is being sunk to greater depth. Drill hole No. 45 is still in 4 per cent. chalcocite at 580 ft. Holes 51 and 53 are in the capping. Hole No. 54, on the western part of the property, is 90 ft. deep, and hole No. 55, 300 ft. west and 1100 ft. south of shaft No. 1, is over 100 ft. in depth. Both the latter holes are in the capping.

Summit Copper Company—Work on the mill will be started soon. It is probable that the dry concentrating method will be used, experiments having shown this manner of concentration fitted to the Summit ores. The station on the 600-ft. level is almost completed. When the station is finished crosscutting will be started to explore the Pasquale vein at that depth.

Copper Reef—On the 500-ft. level of the inclined shaft the crosscut has progressed about 20 ft. It is being driven to explore the North Star vein. The California tunnel is 185 ft. long and has passed through the vein and about 25 ft. into the hanging-wall. A drift has been started on the vein from the tunnel.

Barney Development—At the property the second churn-drill hole is 650 ft. deep, and is expected to enter the ore zone within 75 or 100 feet.

Superior & Boston—Instead of driving a crosscut north to the Old Dominion fault from the point of contact of the present southwesterly drift and the Great Eastern the company will crosscut from the 1000-ft. station for the former vein. The face of the southwest drift is now within about 20 ft. of the Great Eastern. The pump recently installed on the 1000-ft. level began lifting water April 4 and is handling all the water.

Mohave County

Gold Road—The property is being examined under a contract for sale to eastern interests reported to be the U. S. Smelting, Refining and Mining Company. The mine has an oreshoot 3000 ft. long and 8 ft. wide.

Pima County

Chesterfield—This copper company operating near Tucson, H. W. Brown, president, is negotiating for the Protection and Glance properties, extensions of the Esperanza, now operated by the company and developed to 300 feet.

Yavapai County

Arizona-Nevada—Reports are in circulation to the effect that the Arizona-Nevada Copper Company is to be superseded by the Bagdad Copper Company. The change in title does not in any manner affect the development of the properties and operations will be continued as heretofore.

California

Amador County

Bunker Hill—The cleanup at this mine for March was $30,000, the result of the first month's operation of the full 40 stamps; though not for the entire batteries the full time, as the 20 old stamps were idle during a portion of the time, while being overhauled. The mill was kept going on low-grade ore. A new electric motor is being installed.

Argonaut—A 500-h.p. electric motor for hoisting is on the road from Eastern manufacturers, to supplant the water motor.

Hardenburg—The gallows frame for the hoist is completed, supported by concrete piers; the reels are ready for the cables, and the electric motors in position. The motor for the hoist is 150 h.p.; the air-compressor motor is 100-h.p. The power line will be tapped with a 1200-ft. cable. The engine room and transformer house are of corrugated iron, the latter having concrete floor.

Mineral Point—A 10-h.p. gasolene engine has been installed at this mine in Murphy gulch, near Jackson. George Hambric, manager.

Butte County

Indications of a prosperous season in the Magalia and Nimshew districts are reported. Development is in progress, notably on the Mammoth Channel, Mineral Slide, Robbers' Roost, Eureka, Bader and Kid mines.

CALAVERAS COUNTY

Conradi—The 10-stamp mill, hoist and compressor formerly operated on the Lucas mine, on Mokelumne river, has been purchased for this mine near Railroad flat, by F. L. Harrington, owner.

Three B—This is a new gravel mine opened up by Ralph King and others of the Ariel quartz mine, near San Andreas, and said to be the largest gravel deposit in the country. The gravel bed has been opened for a distance of 100 ft. by an open cut, and has a width of 30 ft. between walls, and prospects to a depth of 60 ft. A water-power hoist will be installed.

Smythe—This mine, near Angels, will soon be put in operation, by Leopold Ziegler, of Milwaukee, who has recently purchased an interest.

ELDORADO COUNTY

Georgia Slide—The first of the Beers mills at this mine, near Georgetown, began grinding April 7. If successful in operating the tailings that accumulated from early operations other mills will be installed. An electric plant is planned.

Davidson—This old mine, near Shingle, has been bonded by Hugh C. Cline and others, of Sacramento. A recent mill test from the 80-ft. shaft was sufficient to decide a continuation of the shaft to 300 ft. If the developments warrants a 10-stamp mill will be installed.

Gold and Silver—A third shift has been put on at this mine, near Slatington. Should the orebody develop to good size, a stamp mill will be installed. W. A. Hooton, superintendent.

IMPERIAL COUNTY

The gold discovered east of Brawley and northeast of Holtville, 10 to 15 miles is reported to occur in the black sand of what is locally known as the beach line, a mesa 50 to 60 ft. above sea level. A large number of claims have been staked. An artesian well, 2½ miles north of the Shepherd ranch, and 10 miles from Holtville, recently driven, is said to be flowing 75 gal. per min. and has a temperature of 119 deg. A storage reservoir is being constructed. The water is palatable, and when cooled is available for drinking. This well is within two miles of the nearest mining locations. Water for gravel washing is available at a depth of 40 feet.

NEVADA COUNTY

Champion—This mine, which is under bond to the North Star Mines Company, is being more extensively operated than for several years. Sixty men are employed by the owners in ore extraction, and 20 in exploration by the North Star company.

Brunswick—A 200-h.p. six-plunger pump, with a capacity of 600 to 800 gal. per min., is to be installed, when the 450-shaft will be deepened. Electric power will be employed.

Pioneer—This quartz mine, at Dutch flat, is being retimbered, and will be extensively developed by Harry B. Morse, formerly manager of the Yuba mine at Maybert, who has a bond for purchase. The Pioneer was formerly a big producer.

YUBA COUNTY

Yuba Consolidated Goldfields Company—The new dredge No. 13 was launched at Hammonton April 8. This boat is designed to handle 300,000 cu.yd. of earth per month; length 241 ft.; with machinery installed will weigh 1600 tons. It cost $250,000, as against $115,000 for each of the other 12 operated by this company. Three shifts of 11 men each will be employed in operation. A considerable portion of the machinery was constructed at the shops of the Yuba Construction Company, of Marysville.

Marysville Gold Dredging Company—The new dredge No. 4, built by this company, was put in commission on April 8, at Marigold. The boat is similar to the smaller ones of the Yuba Consolidated, and cost $115,000. Three shifts of 11 men each are employed in operation.

Blue Gravel—About 100 men are employed on the flume in preparation for reopening this hydraulic mine by the Tarr Mining Company. The mine was a producer in the early days, but was put out of business by the Anti-Débris Commission. Plans are said to have been adopted, enabling the company to operate in compliance with the law: but the county supervisors are inclined to think that the plan will not succeed.

Boston Consolidated—This mining company will advance the tunnel in the mine at Browns Valley 700 ft., and expects to cut the Hope vein in the next 20 ft. The company is composed chiefly of local men.

Colorado

CHAFFEE COUNTY

Belle of Granite—In an abandoned stope on the above mine, a narrow streak of extraordinarily rich gold ore has been opened with an additional 5 ft. in width of mill ore. It is stated that in two weeks ore to the value of $100,000 has been blocked. This mine is owned by the Low Pass Mining Company and produced rich ore 30 years ago. The old dumps will now all be treated and marketed.

LAKE COUNTY—LEADVILLE

Dankin—In a recent issue of the JOURNAL it was stated that a "cave in" of a drift, which took Lessee Brady two weeks to clear up, has disclosed a fine body of ore. It is now stated that on following the ore downward it has widened to 14 ft. and carries 360 oz. silver and 40 per cent. iron to the ton.

McMahon—Edward McGee, leasing this mine on Sugar Loaf, has opened a small streak of ore that carries 340 oz. silver and 5 oz. gold per ton.

Little Chief—In one of the lower levels of this mine, Burton & Co., lessees, have opened a good body of carbonate of zinc, thus proving the extension of the zinc belt to the west. The same lessees are said to be shipping about 50 tons of zinc carbonate from the South Seneca & Hayden shaft.

Pittsburg—A cave of the surface, causing the lower workings to give way, has exposed a streak of zinc carbonate of shipping grade. A new shaft is being sunk, from which a level will be driven to catch this oreshoot.

TELLER COUNTY—CRIPPLE CREEK

El Paso—The March production of the El Paso Consolidated Gold properties on Beacon hill was 127 carloads of ore, said to be the record production from this mine, the average of the ore is given at $23 per ton.

Stratton Estate—Many years ago Carl Johnson took a fortune out of the Half Moon, on Gold hill, and since then it has been idle. It is now leased to Trumbach & Neal, and it is reported that they have discovered 3-oz. gold ore in one of the old stopes and have commenced to ship.

Gold Dollar—This mine is shipping from the main shaft and also from the Mable M. and Husted shaft.

Jerry Johnson—Several new oreshoots have been opened and much ore is being shipped by Frank Caley, lessee.

Isabella—From this property, on Bull hill, 54 cars of ore were sent out in March, the average grade being stated to be about 1 oz. gold per ton.

Forest Queen—In March, 16 cars of ore were shipped by John Conners, lessee.

Findley—From the Findley and Shurtloff claims, on Bull hill, 60 tons of mill ore were shipped in March.

Doctor-Jack Pot—Seven hundred tons of mill ore were shipped from this property in March, average about 1 oz. gold per ton.

Trilby—Thirty-one cars of mill ore were shipped by lessees, Van Tilborg & Olsen, in March.

Dante—This Raven Hill mine's March production was 900 tons of mill ore from two shafts.

Jo Dandy—It is stated that Manager J. M. Wright has let a contract for the erection of a cyanide mill of 100 tons capacity for this mine, on Raven hill.

Vindicator—The March production of this mine was about 3500 tons, said to average about 1¾ oz. gold per ton. It came from the 1200 and 1300 levels. The sump has gone dry and the shaft will be sunk to 1500 feet.

Little Bessie—Samms & Co., leasing the above mine on the Saddle, between Beacon and Guyot hills, report a strike of 11 ft. of $15 ore.

Christmas—Two carloads per day of 1½-oz. gold ore are being hoisted through the Golden Cycle shaft by Carr & Milliken, lessees.

CLEAR CREEK AND GILPIN COUNTIES

Seven Thirty—A. D. Bryant, lessee, operating through the Hercules tunnel, has opened a vein of ore 10 in. in width, carrying 325 oz. of silver to the ton. It is expected to send out about 10 tons per month. O'Hagan & Co., lessees on the same property, have an orebody 2 ft. in width from which shipments have been made that were settled for at 70 oz. silver and 35 per cent. lead per ton.

Egyptian—The March production under the Kramer lease was 150 tons. The orebody is said to be one of the largest now being worked in Gilpin county and is 8 ft. wide, the ranges from $16 to $70 per ton.

Russell—A fine body of concentrating ore has been opened at the 300 level by Mark Harris, lessee.

SUMMIT COUNTY

King Solomon—This company has advanced the tunnel in Royal mountain to 5000 ft. and is continuing. About 3000 ft. of drifting has also been done. It is reported that 11 veins have been cut. Recently high-grade lead-silver-gold ore was encountered in the No. 2 vein.

Idaho

COEUR D'ALENE DISTRICT

Stewart—Following the report of the strike of an oreshoot on the property, comes the announcement by J. C. Denny, of Butte, Mont., who inspected the mine recently, that $75,000 will be expended upon a new mill. A reserve fund has been created for that purpose. The oreshoot, Mr. Denny says, is 500 ft. in length and over 3 ft. in width. More than 50 ft. is in solid galena.

Montana

BUTTE DISTRICT

Anaconda—At the Mountain View mine both hoisting compartments of the main shaft have been furnished with new guides from a point between the 800-ft. and 900-ft. levels to the surface. This shaft is now plumb its entire length, and in excellent condition for the hoisting of ore when the mine re-opens. The skip-pocket on the 800-ft. level has been relined and a compartment added to it for the reception of first-class ore only. A new skip pocket has been cut on the 1400-ft. level which also contains a compartment for first-class ore. The new orebins are nearing completion, and will be ready for use about April 20. The Mountain View, which will be the first Butte mine to use compressed air for running the hoist, will be ready very shortly to make the first test of its practicability. The Pennsylvania mine is employing about 440 men at present and between 900 and 1000 tons of ore is being hoisted daily. On the 1800-ft. level the South crosscut, which is now at 1400 ft. from the shaft, is still being run at an average of 70 ft. a month. On the 800-ft. level a fine vein of ore was recently cut, and a drift which has now been driven east over 100 ft., has proved the vein to have an average width of about 15 ft. between well defined walls, and a continuous body of good ore. At the Badger State mine the Edith May vein has been cut by the South crosscut on the 1800-ft. level at a distance of about 500 ft. from the shaft. The lead at this point has a width of 33 ft. from wall to wall and averages about 3 per cent. copper. Drifting on the vein has been commenced both east and west from the crosscut.

Alex Scott—N. F. Hugo, of Duluth, president of the Butte Alex Scott Company was here last week making an inspection of the Alex Scott mine, and left with the feeling that the mine was never is as good condition as at present. The shaft is down to the 1600-ft. level, and drifting and crosscutting has been done on the 500, 1000, 1200, 1400, 1500 and 1600 levels with good results. An average of more than a car per day is being sent to East Butte having an average value of 8 per cent. copper and a little silver. On the 500-ft. level a crosscut has been driven south 500 ft., to where a vein has been intersected carrying high-grade ore.

Little Annie—This property, owned by the Butte Alex Scott Company, adjoins the Goldsmith mine near Walkerville. The Goldsmith was a rich silver producer in the days before the slump in silver, and on the strength of this the Little Annie will be extensively developed. A vertical shaft, which has now attained the depth of 40 ft., is being sunk. An electric hoist, with a capacity for sinking 800 ft., will be installed shortly, and an electrically driven air compressor is being put in place.

LEWIS AND CLARK COUNTY

Drumlummon—The St. Louis Mining and Milling Company, which recently purchased this famous old Marysville property, is preparing to work it again in conjunction with the St. Louis. Six months to a year will be required to unwater the property.

MADISON COUNTY

According to the report of F. B. Miller, assayer in charge of the United States Assay office at Helena, for March, Madison county leads all others in the output of gold. The shipments from the counties are as follows: Madison $32,973; Broadwater $1337; Chouteau $25,420; Fergus $31,900; Granite $264; Jefferson $35; Lewis and Clark $11,587; Park $61; Powell $432; Silver-Bow $78; a total of $104,029.

Apex—C. R. Stranahan, who has had a lease on this property for a year or more, has temporarily stopped work there and is now working the Ora Cache, an adjoining property and former gold producer.

Minnesota

Sharon—This company has taken an option to lease 160 acres of land is Sec. 3 T 62 R 12. The land lies between the White Iron Lake property and the Lucky Boy and Asa Camp properties. The fee is owned by Perry D. Jones, of Portland, Ore., and Ephriam Moran and James La Bree. F. C. Platt will have charge of development. A preliminary exploration will soon be made with a view of locating drills, and it is expected that a shaft will also be sunk this summer.

Nevada

A correspondent writes from Virginia City: "Recent developments on the Comstock are attracting wide attention, especially the discovery in the Mexican mine of rich ore. Other adjoining mines have excellent prospects, Ophir and Con. Virginia mines are producing bullion steadily, as well as a half dozen other properties on the lode. Operations have now reached a point where interesting developments are of almost daily and weekly occurrence."

CHURCHILL COUNTY

Nevada Hills—The steel and machinery for the 125-ton mill are arriving and construction is under way. Electric power will reach the camp by May 15. The shaft is down 200 ft. and will be continued to 650 ft. The total expenditure for the mill will be $250,000 and $40,000 was advanced to the electric-power company to extend the line. George Wingfield is financing the property.

ESMERALDA COUNTY

Vinegerone—The report of Messrs. Burch and Wiley, on this claim of the Jumbo extension places a value of $195,000 on the ore developed, much less than the valuation made in an earlier report.

ELKO COUNTY

National Mines Company—At the directors' meeting last week, the Peltons resigned, and H. A. Foss was chosen general manager and F. E. Taylor assistant manager.

NYE COUNTY

Round Mountain—The company has decided not to use the Gold Bar mill at Rhyolite, but has ordered a new mill equipment. Key Pitman is working a placer lease on the property.

Big Four—This leasing syndicate at Manhattan has ordered a 100-h.p. motor

and a 10-drill compressor and two Knowles pumps.

West End—It is reported that 6 ft. of ore has been opened in the crosscut on the 300-ft. level.

Utah

Beaver County

Wild Bill—Drifting is being done on the 700, and is expected to reach the vein opened on the upper levels within a short distance.

Horn Silver—The new 100-ton mill began limbering up the machinery, April 4. The crushers have been given a try out, and things appear to be in fair working order, though the pumps have given some difficulty. There is said to be a large tonnage of milling ore broken in the mine ready to be put through. This will run approximate 10 to 12 per cent. lead and 8 to 10 oz. silver. There is also enough ore blocked out between the 300- and 900-ft. levels to keep the mill going for some time. It is figured in mining this milling ore that some shipping ore will be obtained.

Imperial—Preparations are being made by leasers for sinking from 130 ft. to below the 300-ft. level, and crosscutting for ore opened above. Ore running well in copper, and carrying from 5 to 15 oz. silver, has been mined in the past. The property is near the old Cactus mine in the western part of Beaver county.

South Utah—Additional equipment has been ordered for the mill which has been in operation since September. The plant has not been run beyond 50 per cent. of its capacity. According to company report the monthly earnings have been as high as $10,000, but in February a lower grade of ore was treated, which reduced earnings considerably. The company is reported to have cash assets of about $166,000. On the 600-ft. level copper ore has been opened 100 ft. and is said to run better than 3 per cent. copper. Ore, which is thought to be a continuation of this body has been found on the 700.

Utah United Copper—It is proposed to give a contract for sinking the shaft to the 500-ft. level.

Lower Cave—A tunnel has been driven, which is 400 ft. lower than the workings in the Cave property adjoining, and is reported to have cut 8 ft. of ore carrying lead and zinc. This property is on the east mineral zone, while the Moscow, Red Warrior, Hub, and Cedar-Talisman are on the western side of the county.

Horseshoe—A strike of silver-lead ore is reported to have been made on this claim in the Star district. The pay streak is about a foot wide.

Utah Mining, Milling and Transportation—This company is not shipping at present on account of the poor condition of the roads, but is doing development. The shaft has been sunk from the 300- to the 400-ft. level, and crosscutting for the vein started. It is expected to continue the shaft to the 500, if this can be done without interfering with other development. On the 300 level the orebody is reported to be 20 ft. wide.

Juab County

May Day—The annual meeting was held in Salt Lake City April 3. The directors for the coming year are John Dern, James Chipman, M. P. Braffet, W. S. McCornick and J. C. Dick. The financial statement showed the year to have begun with an overdraft of $10,090, and to have closed with $4394 cash on hand March 31, 1911. During the year 3205 tons of ore, valued at $52,766, and 691 tons of concentrates, valued at $14,543 were marketed. Assessment No. 9 brought in $16,000 which, with miscellaneous receipts of $247, brought the total receipts to $83,556. Leasers discovered new ore on the 400-ft. level, a continuation of which was broken into by the company in raising from the 500. The ore has been opened for 60 ft., and is of good milling quality. A continuation of the orebody will be looked for on the 700 and 1100 levels. The handling of low-grade material on the dumps during the year helped the company to secure funds for development without calling for more than one assessment. A recent strike of shipping ore is reported in a raise. During the year, a distribution of May Day stock was made as a dividend by the Uncle Sam company, which was one of the largest shareholders, as it was thought the May Day would be obliged to finance its development by assessments, and the Uncle Sam did not consider its treasury should be subjected to this drain.

Opohongo—Ore carrying copper and gold has been followed on the 500-ft. level for 60 ft., and is 15 ft. and upward in width. A winze is being sunk to make connections with the 700-ft. level, when ore will be sent down and taken out through the Gold Chain shaft.

Salt Lake County

Silver Shield—One car of 50 tons has been shipped, and two more are ready for shipment. This ore came from the level 300 ft. above the working tunnel, and from the winze being sunk on the new strike in the tunnel level. The winze is down 20 ft. Water is being taken care of by means of a hand pump.

Columbus Extension—The main tunnel is in about 5000 ft., which gives 1500 ft. depth. Several fissures were cut in driving the tunnel, but no effort has been made as yet to develop them. In one of the drifts near the face a fissure was opened recently, which was reported to be six feet between walls. A part of this is of shipping grade. During the past 10 days 75 mine-cars of first-class ore are said to have been mined. The objective of the tunnel is a fissure, which is figured to be 800 ft. ahead of the present face.

Summit County

Daly West—A dividend of 30c. per share, or a total of $54,000 has been declared payable April 15. The total dividends paid including the present one will be $6,256,000. A profit was netted during the year as compared to a loss for 1909, and while there is cash in the treasury, it is uncertain whether dividends will be kept up. There is estimated to be enough milling ore on the lower levels to operate the mill throughout the year. Royalties are being obtained from leasers, who are still at work, and conditions at the property are reported generally favorable.

Silver King Coalition—Thirty employees in this company's mill walked out April 4, because the demand for an eight-hour shift was refused. Up to a short time ago one shift was employed in the mill, and the men worked 10 hours a day. A second shift was put on recently. The men then demanded eight-hour shifts. This was refused on the grounds that the men had always worked 10 hours, and should continue to do so. The five men at the sampling mill have walked out, demanding an eight-hour shift. A meeting of the Miners' Union has been held. Following the strike of the mill men the mine was shut down April 7, and 300 men or over laid off. A few were retained for repair work, during the shutdown. The bins are full with no place to store ore at present. General Manager Kearns is expected to return from California shortly, and it is thought the matter will then be adjusted.

Golden Head—It is hoped to start work shortly at this property on Bonanza flat.

Quincy-Thompson—The 1400-ft. level of the Daly West, which is being extended, will reach the end lines of this property early in May. The work will then be taken up by the Quincy, and carried to its ore-bearing territory, which is thought to be about 350 ft. from the line. Ample facilities for drainage have been arranged, though no large flows are looked for. The 1400 level of the Daly West will give a depth of 1700 ft. in Quincy-Thompson ground.

Little Bell—Shipments of ore running in the neighborhood of $40 a ton have been made recently. This is more than covering development expenses. No milling is being done.

New York Bonanza—Conditions at this property are reported to be improving. About 50 tons of ore are waiting shipment. The winze below the 900 has fol-

lowed ore for 25 ft., and a raise is in ore 50 ft. above the 900 level. The vein is about 14 in. wide, and it is thought will continue to the 800. Hauling ore cannot be resumed before the middle of the month, as the wagon roads are unusually heavy.

Canada

The Keekeek district is attracting attention on the report of good gold discoveries. This district is about 100 miles north of Haileybury and is in the province of Quebec, and very favorable reports are coming down regarding the showings of gold. Another rush started a few days ago into the district near Whitefish lake, between Elk Lake and Fort Mattachewan, the Hudson Bay Company post.

British Columbia

Standard—Construction of an aërial tramway, 8400 ft. long, from mine to mill site, and erection of 100-ton concentrating mill, are under way. A 10-drill compressor and six machine drills have been purchased.

Western Fuel Company—Two new mines are being opened within a few miles of this company's Nanaimo colliery. A compressor has been bought to facilitate this work.

Hidden Creek—The Granby Company exploration work, both diamond drill and driving, is proving so satisfactory that confidence is felt the company will take up its bond on this property.

Portland Canal—First shipment, consisting of 450 tons of iron concentrate containing gold, has reached Tyee Copper Company. Silver-lead concentrate is to be shipped to Tacoma. Capacity of concentrator is being increased from 50 to 75 tons daily.

Sullivan—March shipments of lead ore to Consolidated smeltery, Trail, totaled 3628 tons, containing 824 tons lead and low value in silver.

Ontario—Cobalt

The shipments from Cobalt for the week ended April 7, were: McKinley-Darragh, 239,910 lb.; Kerr Lake, 120,200; Cobalt Lake, 109,800; La Rose, 107,200; Silver Cliff, 85,000; O'Brien, 66,270; Buffalo, 62,130; Coniagas, 53,700; Trethewey, 50,830; Crown Reserve, 44,800; total, 939,840 lb. Bullion shipments, Campbell & Deyell's sampler, 1464 ounces.

Big Six—This Elk Lake company has been reorganized and will start work shortly.

Beaver—The directors of this Cobalt company have declared the first dividend of 2½ per cent., payable May 15. High-grade ore has been found on the 350-ft. level and returns from shipments are high. It is expected that the company will be able to pay 2½ per cent. quarterly from now on.

Crown Reserve—The regular monthly dividend of 3 per cent. with a 2 per cent. bonus has been declared. The cash reserve now totals $698,000. Dividends paid to date amount to 165 per cent. The income for March was about $400,000, and after meeting all obligations $35,000 was added to the reserve fund.

Temiskaming—This Cobalt company is now mining ore at 575 ft. On April 1 the surplus amounted to $377,165.

Ontario—Porcupine

Swastika—This gold company will install machinery of sufficient capacity to carry on the work at a depth of 400 feet.

Vipond—The president of this Porcupine company denies that there is any trouble over the title of the property.

Hollinger—Assays have been made showing good gold, for 30 ft. in the schist, on one side of the vein. The grade at the 200-ft. level is reported to be higher than at 100 ft., where the general average of the vein is given at $49.50 per ton. Development is progressing rapidly, about 150 men being employed. Drifting has been done for 60 ft. on the 200-ft. level, the vein being 10 ft. wide and rich in free gold. On the 100-ft. level the two shafts are connected by a drift and a total of 1400 ft. of drifting has been accomplished. A crosscut run on this level has encountered a quartz vein previously found on the surface. The machinery for the new mill and the new hoist and compressor are on the ground.

West Dome—The shot-drill, operating on this Porcupine property, has cut the main orebody at 330 ft., at which point it showed gold. Several other veins were cut during the course of drifting that may develop into something important.

Burns-Goad—These properties in Porcupine, have been purchased by Chicago capitalists. A complete outfit, including a 10-stamp mill, has been purchased and will be brought in by boats.

Dobie—Free gold has been encountered by diamond drilling at a depth of 240 feet.

Ontario-Porcupine Gold Fields Development Company—This company has been organized as a subsidiary company by the Northern Ontario Exploration Company to operate the 50 Porcupine claims acquired by the latter. The capitalization is $3,000,000, of which the working capital will be $450,000 in addition to plant now on the field. Bewick, Moreing & Co. will be the general managers. The board of directors includes Cyril Vanklyn, Charles Algernon Moreing, W. E. Lawson Johnston and D. Richards, of London, England; D. E. Dunlap, Toronto, and Charles Hart, Montreal. An advisory committee in Canada will consist of Noah Timmins, Henry Timmins and John McMartin.

Mexico

Baja California

Estrellas—This mine in the Todos Santos region, has been bonded to E. J. Fernandez, of Ures, Son., and George W. Pickett, of Tucson. A single-stamp prospecting mill has been installed.

Chihuahua

Adargas—This property at Jimenez has been sold to an English company. H. P. Eustice of Los Angeles, Cal., is in charge. Equipment to handle the large water flow will be installed.

Guanajuato

Tajo de Dolores—The mill is now operating the full 40 stamps mostly on ore from the old drifts.

Hidalgo

Santa Gertrudis—Delays in construction have deferred the beginning of mill operations until June 1.

Jalisco

Espada Mines Company—This company, in the Hostotipaquillo district, controlled by A. J. Vick, of San Antonio, Texas, Edward Thomson, manager, has leased the Virginia & Mexico mill on the Santiago river and will construct an aërial tram 2½ km. long

Sonora

Ancient—The company is installing a 10-stamp cyanide mill on the Cura Moretos claim in the Arizpe district on the Sonora river. S. R. Norton is manager, George H. Prudden, Minneapolis, Minn. president.

Greene-Cananea—A new orebody has been encountered at the Sierra de Cobre property in the No. 5 Eureka tunnel. It is reported to be 40 feet in width and average 5 per cent. copper. The first shipment of Miami concentrates amounting to 300 tons was received last week.

Las Chispas—The mine is closed down on account of the revolutionary disturbances and all employees have been dismissed.

Tepic

Mescalitos-Purisisima—This company will erect a 20-ton mill in the Amatlan de Canas district. Water power from a flowing hot spring will be used. Walter Foster and E. M. Browder are principally interested.

Zacatecas

Santa Rosa—Volney D. Williamson announces that the deal for the sale of this property in the Concepcion del Oro district to the Exploration Company, of London, has been concluded after a delay of several months, due to the revolution. The Santa Rosa Exploration Company, capital $750,000, has been organized to acquire and operate the property. The mine is developed to 1800 ft. but has no mill.

The Markets

Coal Trade Review

New York, April 19—Coal trade in the West is still in rather a demoralized condition. A late cold spell, extending from the Mississippi to the seaboard, gave a temporary boost to the domestic fuel demand; but in the nature of things this cannot last long. Steam-coal business is still rather slow. There is little prospect of any check to overproduction and resultant competition of different districts for trade. Throughout the Central West half time is the rule at most mines, and there is still an abundant supply.

The seaboard bituminous market is slow and the spring trade is backward. In this business also there is strong competition and low prices rule in making yearly contracts and in the open market.

Anthracite trade is steady and has benefited by the late cold weather. The large production in March has been well absorbed, and April shipments are expected to make a good showing also.

The Irwin District Strike—A Pittsburg despatch reports that the local Mine Workers' officers have decided that they will not hold out for a recognition of the union if the coal operators of the Irwin field will pay union wages and give the men working hours and conditions that are satisfactory. The operators have already expressed their willingness. The prospect is for an early settlement of this strike, which has lasted 13 months.

Coal Traffic Notes

Coal and coke tonnage originating on all lines of the Pennsylvania Railroad Company east of Pittsburg and Erie, three months ended March 31, short tons:

	1910.	1911.	Changes.
Anthracite	2,822,612	2,988,025	I. 165,413
Bituminous	11,267,286	10,162,175	D. 1,105,111
Coke	3,985,861	2,740,636	D. 1,245,225
Total	18,075,759	15,890,836	D. 3,184,923

The total decrease this year was 12.1 per cent.

Bituminous-coal and coke tonnage of leading railroads in Pennsylvania and West Virginia, two months ended Feb. 28, short tons:

	Bituminous	Coke	Total
Pennsylvania	6,594,138	1,683,771	8,277,909
Balt. & Ohio	4,316,699	569,140	4,885,839
Buff., Roch. & Pitts.	1,229,155	75,626	1,304,781
Buff. & Susquch'na	280,556	51,160	331,716
Penn. lines, N. Y. C.	1,390,103	12,899	1,403,002
Pitts. & L. Erie	1,308,296	802,958	2,111,254
Pitts. Shawmut & N.	249,533	3,723	253,256
Norfolk & Western.	2,793,447	314,574	3,108,021
Ches. & Ohio	2,557,763	17,970	2,575,733
Virginian	380,651	.....	380,651
Total	21,100,341	3,531,821	24,632,162
Total, 1910	21,998,388	5,485,202	27,483,590

Decrease in coal this year, 898,047 tons, or 4.1 per cent.; in coke, 1,953,381 tons, or 35.6 per cent.; total decrease, 2,851,428 tons, or 10.4 per cent. The Virginian railway does not report coke separately. Anthracite tonnages of Pennsylvania and Baltimore & Ohio are given elsewhere.

Anthracite carried over Baltimore & Ohio railroad, two months ended Feb. 28, was 228,817 tons in 1910, and 186,717 in 1911; decrease, 42,100 tons.

Receipts of domestic coal at San Francisco, two months ended Feb. 28, were 56,476 tons in 1910, and 46,118 in 1911; decrease, 10,358 tons.

The official report gives the coal production of the State of Ohio in 1910 at 34,424,954 short tons; an increase of 6,669,090 tons over the previous year.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

New York

Anthracite

April 19—Trade in domestic sizes remains very good, the continued cold weather helping sales materially. Steam sizes are in better supply than they have been, and prices are pretty well maintained.

Schedule rates on domestic sizes for April are $4.25 for lump, $4.50 for egg and stove and $4.75 for chestnut, all f.o.b. New York harbor. On steam sizes quotations are: Pea, $3@3.25; buckwheat, $2.35@2.80; No. 2 buckwheat or rice, $1.80@2.30; barley, $1.40@1.75; all according to quality, f.o.b. New York harbor.

Bituminous

Coastwise trade remains about the same; New England consumers have not got down to the bottoms of their bins yet, and are holding back. Contract making is very slow, and it begins to look as if some big consumers have decided to trust to the open market. Harbor trade is dull.

Prices are about the same. For steam coals the lowest prices named are $2.40@2.50, New York harbor, for lower grades, with higher-grade coals up to $2.85@2.95. A fair Miller vein coal brings about $2.60@2.65. Gas coals can be had at $1.05@1.10 for ¾-in., $1@1.05 for run-of-mine and 75@80c. for slack, all at mines.

Mines generally are not running full time, and shipments to tide have been on a scale corresponding to the market.

In the coastwise trade vessels are moving more freely, but rates are unchanged. Going rates are 75@80c. from Philadelphia to Boston or Portland; 65@70c. from New York to points around the Cape; 30@40c. to Providence and the Sound. From Norfolk to Newport News the rates are 75@85c. to Boston or Portland.

Birmingham

April 17—The coal trade in Alabama is dull as compared to recent conditions. A number of mines in this district are running on slack time, while in some instances there is no anxiety to get out coal at all, just enough operation at the mines to hold the labor. The quietness is believed, however, to be temporary.

The State legislature in the last days of the session adopted a new set of mining laws which, it is believed, will regulate the business as well as the operation.

Chicago

April 17—General conditions in the coal market are better than a week ago. Both steam and domestic coals find larger sales for current needs, and contracts are being freely made, with prices about the same as those of a year ago or a little lower. Supplies of Illinois and Indiana coals have been well restricted, so that there is little profitless price cutting. Eastern coals, however, are not so strong and shipments should be made carefully. The current supply continues to absorb screenings chiefly, and these are strongest.

Illinois and Indiana bring in general $1.80@2.30 for lump, $1.70@1.80 for run-of-mine and $1.60@1.85 for screenings. Hocking holds up fairly to the $3.15 mark. Smokeless is too plentiful for the maintenance of prices, run-of-mine selling for $3.05@3.15 and lump for $3.55@3.80, with the lower quotations oftener obtaining. Anthracite sales are very good in both city and country.

Indianapolis

April 17—The local coal market took on quite a stiff tone during the recent cold snap, lasting about 10 days; it gave almost steady work for men at the Indiana mines supplying the domestic trade. Retail coal dealers from many points found that consumers had barely tided over until the end of March, expecting to be done with using coal for heating purposes by April 1. The result was a rush for immediate delivery of coal. There is also a hard-coal famine in Indiana and it is being relieved by the use of soft coal for domestic use.

The demand for steam coal, however, is disappointing. Operators say many large factories are running at a greatly reduced capacity and the mines are overstocked with steam coal.

Pittsburg

April 18—There has been no further increase in mining operations due to the opening of the Lake season since that already reported, for the opening so far promises to be only a formal affair. The coal trade must wait on the ore trade, which so far has promised very light shipments to July 1. Commercial demand for coal continues light. Prices are not materially changed in the week, but as the condition seems to be more or less fixed that some producers will shade the open or theoretical price at $1.15 more on nut than on mine-run coal, we change our figures by quoting separate prices on the two grades. The lowest cut price made so far as known is $1.05, this being done frequently on nut, but rarely on mine-run. A number of producers are not naming these cut prices, but are contenting themselves with producing coal against their regular contracts. We quote: Nut, $1.05@1.15; mine-run, $1.10@1.15; ¾-in., $1.25; 1¼-in., $1.35; slack, 75c. per ton at mine.

Connellsville Coke—There has been nothing done marketwise. There are reports that coke is accumulating, but this has not been confirmed by producers offering prompt coke in the market, as is usually the case. The Frick company is reported to have a surplus, presumably on account of preparations to bank or blow out some furnaces. We repeat former quotations, but would note they are practically nominal: Prompt furnace, $1.60@1.65; balance first half, $1.65@1.70; second half, $1.75@2; prompt foundry, $2@2.10; contract, $2.20@2.40, at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended April 8 at 362,769 tons, a decrease of 5000 tons; and shipments at 4062 cars to Pittsburg, 6172 cars to points west and 859 cars to points east, a total of 11,093 cars.

St. Louis

April 19—The weather has been warm this week and as a consequence the retail demand for coal has slackened up a great deal. There has been quite a fair domestic market for the past month. The peculiar feature of the market has been a decided slump in screenings in the last four of five days. It seems that the tonnage of lump coal for domestic use must have produced enough screenings to break the market for the time. Yet this theory is hard to believe as the make of lump was no larger last week than for several weeks preceding it. On the other hand, all the plants seem to be running about as full as usual, and consequently the marked drop in screenings looks as if it were an effort at manipulation. Of course, the fact that a number of large steam plants are crushing mine-run and lump has some effect.

High-grade coals are moving slowly locally, and in fact a very small tonnage is being received.

The recent report of the Merchants' Exchange puts the coal that was consumed in St. Louis in 1910 at 300,000 tons of anthracite and 10,000,000 tons of soft coal.

The St. Louis Coal Company, of St. Louis, has taken over the output of the Massie mine, on the Louisville & Nashville, at Belleville, Ill., producing 600 tons daily.

Current prices on the St. Louis market are nominally as below:

Illinois, Standard:	Mine	St. Louis
6-in. lump and egg	$1.10	$1.62
2-in. lump	1.00	1.52
Mine-run	0.90	1.42
Screenings	0.60	1.12
Trenton:		
6-in. lump and egg	2.25	2.77
3-in. nut	2.00	2.52
Staunton or Mt. Olive:		
6-in. lump	1.50	2.02
2-in. lump	1.25	1.77
Mine-run	1.20	1.72
Screenings	0.60	1.12
Carterville:		
6-in. lump or egg	1.30	1.97
3-in. nut	1.20	1.87
Mine-run	1.10	1.77
Screenings	0.75	1.42
Pocahontas and New River:		
Lump or egg	2.25	4.75
Mine-run	1.25	3.75
Pennsylvania Anthracite:		
Chestnut	....	7.20
Stove or egg	....	6.95
Grate	....	6.70
Coke:		
Connellsville foundry	....	5.40
Gas house	....	4.90
Smithing	....	4.15

Prices on track at East St. Louis are 20c. lower than St. Louis quotations as given above.

Anthracite—The movement of anthracite has been very good this month up to date, and it is thought that this April will be a record breaker.

FOREIGN·COAL·TRADE

Italian Coal Imports—Imports of coal and coke in Italy during the year 1910 were 9,314,224 metric tons; an increase over 1909 of 10,718 tons, and over 1908 of 861,904 tons.

German Coal Trade—Exports and imports of fuel in Germany, two months ended Feb. 21, metric tons:

	Exports	Imports	Excess	
Coal	4,252,668	1,299,423	Exp.	2,953,245
Brown coal	10,808	1,065,682	Imp.	1,054,874
Coke	781,400	64,883	Exp.	716,517
Briquets	373,870	27,421	Exp.	346,449
Total	5,418,746	2,457,409	Exp.	2,961,337
Total, 1910	4,307,680	2,397,148	Exp.	1,910,532

The imports this year included 1515 tons of coke to the United States.

German Coal Production—Coal production of German Empire, two months ended Feb. 28, metric tons:

	1910	1911	Changes
Coal	24,141,063	26,196,203	I. 2,055,140
Brown coal	10,872,315	12,138,748	I. 1,266,433
Total mined	35,013,378	38,334,951	I. 3,321,573
Coke made	3,697,953	4,215,274	I. 517,321
Briquets made	3,016,768	3,456,888	I. 440,120

Of the briquets reported this year 2,665,175 tons were made of brown coal or lignite.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of coal on April 8, as follows: Best Welsh steam coal, $4.17; seconds, $3.93; thirds, $3.78; dry coals, $3.84; best Monmouthshire, $3.72; seconds, $3.54; best small steam coal, $2.46; seconds, $2.22. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, April 19—The iron and steel markets seem to be waiting developments and do not show much activity.

Even among steel producers no particularly hopeful view of the immediate future is to be found and the trade seems to be facing a period of reduced demand and output. Expectations are expressed, however, that the second half of the year will see a material improvement. Prices of steel products are fairly well held, but there are some irregularities, more than there have been at any time since the market was firmed up by the general meeting of late last November. In plates, bars and shapes there are reports of shading in the East, and these reports are probably well founded. There are occasional reports of shading on these products in the Central West, but such reports are doubted. It is quite certain that the leading interest and the independents are not cutting prices, for such a thing would be likely to precipitate a wide open market in short order. Shading of sheets has not been abated materially since the meeting of the mills a week ago.

The exceptional point in finished material is structural steel. Some large contracts have been placed and a number of others are under negotiation, which will take large quantities of steel. For this business there is much competition among the large fabricating companies, and prices have been named which imply considerable cuts from quoted prices of steel. Small building is active as well as large, and the jobbing trade in small materials is good.

Foundries in Eastern territory are taking quite a lot of pig iron, but mainly in small lots. It is again reported that Southern furnaces are making a hard push for business. Virginia furnaces have taken a contract to ship 9000 tons

of basic pig to Sydney, Cape Breton. Negotiations are still reported to be going on for the consolidation of several Virginia furnaces, but they seem to be progressing slowly.

Steel Corporation Prospects—At the annual meeting of the Steel Corporation, April 18, Judge Gary spoke hopefully, saying that while the mills were not full up to capacity, they had still a large volume of work to do, and orders had been up to anticipation. April business so far had been less than March. He blamed "politics" for the present quiet in business, specifying the prospect of tariff changes. He anticipated a great rush of railroad buying later.

Baltimore

April 17—Exports for the week included 2074 tons of rails and 127 tons rail-joints to Buenos Aires; 4,419,140 lb. steel billets to Liverpool. Imports included 5000 tons manganese ore from Brazil; 11,100 tons iron ore from Cuba.

Birmingham

April 17—The Southern pig-iron market is still quiet with no immediate prospects of improvement. The general quotations are around $11 per ton, No. 2 foundry, despite rumors that some iron has been selling at 25 to 45c. per ton under that price. There is a steady outward movement of iron, in fact more iron is being shipped out than is being manufactured. The make is being further reduced in the Southern territory, one furnace having gone out of blast the past week with another soon to follow.

Southern manufacturers of pig iron are not pushing sales beyond the third quarter, in fact, most small lots are for second-quarter delivery. Inquiries are still coming in for the last quarter, but the makers do not appear to be willing to sell at $11. Accumulated stocks of iron are showing slight reductions month by month, but there is still a good quantity of the metal in furnace yards.

The steel situation is the same as it has been for the last four weeks. The scrap-iron market is a little quiet.

Iron production in Alabama for the first quarter was: January, 130,174; February, 118,699; March, 145,552; total, 394,425 tons, a decrease of 108,631 tons from last year.

Chicago

April 17—Sales of pig iron are light as regards individual tonnage, though the aggregate of orders is larger than this condition would indicate. Nearly all the foundrymen are buying for second-quarter delivery, a few stretching their contracts over into third quarter and last half. The general tendency is to go lightly, the belief appearing to be general among the melters that another period of larger production than the market can readily absorb exists. Southern No. 2 iron holds nominally to $11, Birmingham, or $15.35, Chicago, and this price is obtained on nearly all the small sales, for delivery within second or third quarters. Northern No. 2 holds to $15 nominally and is somewhat firmer for late delivery. Lake Superior charcoal is quiet at $17.50. General sales of iron and steel products are lighter, though there seem no indications of a marked decrease. The principal lines, railroad supplies and structural material, are very quiet. Coke is inactive, with Connellsville at $4.75, Chicago.

Cleveland

April 17—The long postponed question of ore prices for the season is not settled yet. There seems to be no hurry, as most furnaces have ore enough to last them for two months at least; some of them have more. There is no talk of shipments yet.

Pig Iron—The market is dull, with sales of only small lots, and few inquiries coming in. Quotations for Cleveland delivery continue at $15.90 for bessemer, $14.25@14.75 for No. 2 foundry, $13.50@14 for forge, and $17.50@18 for Lake Superior charcoal.

Finished Material—Some sales of shipbuilding plates and some structural orders make up the bulk of the new business. There is some inquiry for forging billets. Bars are quiet and mills are hunting orders. Some cutting of prices on sheets is reported.

Philadelphia

April 19—Disappointment is expressed today over the results of inquiries and the opening of negotiations a week or two ago, as they have resulted in much less business than was confidently anticipated. This disappointment comes largely from Eastern buyers who, with a few exceptions, have no iron in their yards to speak of. New Jersey and New York buyers, as a rule, are better supplied, but they are quite willing to extend their contracts, if some concession can be made which they feel the conditions of the market not only warrant but demand. This is particularly true of No. 2 foundry. Several offers of No. 2 have been made within a few days. It appears as though Southern makers were insisting upon their full share of business. While there has been no cut in prices they are not as strong as even a week ago. There have been as many as a half dozen good-sized orders placed for Southern pipe iron and it is understood on more favorable terms than have yet been quoted. Ordinary quotations for Northern No. 2X foundry are $16, but good Southern makes are to be had $1 less. Small sales of Northern forge are closed at $14.50 with Southern at about the same figure for the best.

Steel Billets—Deferred buying of steel billets has continued the activity recently noted but in small orders.

Bars—All reports go to show the maintenance of a fair seasonable demand, punctuated occasionally with quite a large order for iron for car purposes.

Sheets—The week's business has been made up of small lots for immediate delivery. Galvanized has become quite a factor, owing largely to the use of corrugated in much construction work now pending.

Pipes and Tubes—Merchant pipe has met with a somewhat better demand.

Plates—The larger volume of business in plates has imparted a better tone to the market. The plate-mill outlook has decidedly improved.

Structural Material—The business for the past week has been made up very largely of orders under 1000 tons, some of them under 100. The structural requirements are opening up nicely and a great deal of business will probably be closed before the end of the month.

Scrap—Scrap of the cheaper grades has been accumulating and some dealers are refusing to add to their supplies; even in the heavier kinds there is more offering than finds ready market. In consequence dealers have been offering their stock at a concession of about 50c. The indications are that the supply of scrap will be beyond the needs of buyers for a good while to come.

Pittsburg

April 18—The ore interests, which conferred in Cleveland last week on trade conditions as affecting prices which should be charged for ore for the season about to open, are meeting in New York today with a number of steel men, the idea being to gain further light on the situation. It is not improbable that a basis will thus be developed permitting the individual ore interests to make sales at flat prices for the season, either at prices ruling last year, or at a cut, say 50c., from those prices. The ore interests have been making a special effort this year to discourage the idea that there is any price agreement contemplated, and their movements have been correspondingly quiet.

The iron and steel market has continued extremely quiet and the only change in the past week has been that there is more general recognition of the fact. Current bookings are well under half the productive capacity, while if production has been reduced below the rate of 70 and 75 per cent., which was reached in March, the reduction so far has been slight. A material curtailment has been inevitable, but the leading interest has been slow to curtail. It is now reported

that it has blown out two blast furnaces, one Edgar Thomson and one Bellaire, and has banked five, three Edgar Thomson and two Carrie, and furthermore that it will blow out seven furnaces by the end of next week. It is stated that the local subsidiary has accumulated 60,000 tons of pig iron since March 1 and if this is correct the circumstance would explain the apparent anomaly which has been remarked in the trade, of its continuing blast-furnace operations in a period of reduced demand for finished steel products.

Pig Iron—The past week has been not merely the dullest of the year; there has been simply no business at all. We repeat former quotations, which may be regarded as largely nominal: Bessemer, $15; basic, $13.75; No. 2 foundry, $14@14.25; malleable, $13.75, all at Valley furnaces, freight to Pittsburg being 90c. Doubtless the uncertainty as to ore prices has accentuated the inactivity in pig iron.

Ferromanganese—Two sales of about 100 tons each for early delivery are reported at not over $36.75, Baltimore, and an inquiry for between 500 and 1000 tons for more extended delivery. We quote the market for prompt or forward at about $36.75, Baltimore, or 25c. less than a week ago, freight to Pittsburg being $1.95 per ton.

Steel—The market has been practically lifeless and it is impossible to develop what are the real prices, since the sales reported last week of odd lots at cut prices. We repeat former quotations, which may be regarded as nominal: Bessemer and open-hearth billets, $23; sheet bars, $24, f.o.b. maker's mill, Pittsburg or Youngstown; wire rods, $29, Pittsburg.

Sheets—Demand for sheets is light, being less than in March, although there has been no material change in the past week. Most mills are maintaining regular prices, but the cutting reported at the meeting of a week ago has not been eliminated, if indeed it has been reduced at all. In West Virginia territory prices seem to be most irregular, and in some quarters this is attributed to local mills taking business at prices needed to shut out more distant mills, while otherwise the shading is attributed chiefly to a few jobbers and purchasing houses. We quote as the regular mill prices: black sheets, 2.20c.; galvanied, 3.20c.; blue annealed, 1.65c.; painted corrugated, $1.55; galvanized corrugated, $2.75 per square.

St. Louis

April 17—The pig-iron market shows a little more interest as some good inquiries have been received during the last week and quite a number of fair-sized orders have been booked at $11 per ton Birmingham or $14.75 St. Louis, the price for immediate shipment. Some fair-sized orders for third-quarter delivery have been booked at this price, but generally an advance of 50c. is being asked.

FOREIGN IRON TRADE

British Foreign Trade—Exports and imports of iron and steel and of machinery in Great Britain, two months ended Feb. 28, are valued by the Board of Trade returns as follows:

	Exports.	Imports.	Excess.
Iron and steel	£ 7,196,410	£1,689,412 Ex.	£ 5,506,998
Machinery	4,714,446	884,912 Ex.	3,829,534
Cutlery and hardware	1,598,872	199,775 Ex.	1,399,097
New ships	620,847	..... Ex.	620,847
Total	£14,130,575	£ 2,774,099 Ex.	£11,356,476
Total, 1910	14,164,155	2,185,308 Ex.	11,978,847

Decrease in exports, £33,580; increase in imports, £588,891. Quantities of iron and steel were, in long tons:

	1910.	1911.	Changes.
Exports	718,590	709,516	D. 9,074
Imports	205,962	265,686	I. 59,724

Imports were largely in crude or half finished forms, as pig iron, blooms, billets, sheet bars and tinplate bars.

British Iron Ore Imports—Imports of iron ore into Great Britain, two months ended Feb. 28, were 1,111,158 tons in 1910, and 1,248,298 tons in 1911; increase 137,140 tons. Of the imports this year 865,806 tons were from Spain. Imports of manganese ore were 84,989 tons in 1910, and 58,092 in 1911; decrease, 26,897 tons.

German Iron Production—The German Iron and Steel Union reports the production of pig iron in the German Empire in February at 1,179,109 metric tons, a decrease of 141,576 tons from January. For the two months ended Feb. 28 the total was, in metric tons:

	1910.	1911.	Changes
Foundry iron	435,026	507,888	I. 72,862
Forge iron	110,108	97,072	D. 13,036
Steel pig	199,264	278,635	I. 79,371
Bessemer pig	76,972	57,601	D. 19,371
Thomas(basic)pig	1,447,555	1,558,598	I. 111,043
Total	2,268,925	2,499,794	I. 230,869

Total increase this year 10.2 per cent. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

METAL MARKETS

New York, April 19—The metal markets generally remain dull and rather uninteresting.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold:			
Mar. 1911	$ 505,615	$ 4,119,063	Imp. $ 3,613,448
" 1910	1,815,815	4,373,885	Imp. 2,558,070
Year 1911	1,854,024	19,465,737	Imp. 17,611,713
" 1910	10,916,081	9,568,358	Exp. 1,347,723
Silver:			
Mar. 1911	5,896,795	3,197,409	Exp. 2,699,386
" 1910	4,552,624	3,994,456	" 558,168
Year 1911	16,001,042	10,746,781	" 5,254,261
" 1910	13,639,547	11,398,139	" 2,241,408

Exports from the port of New York, week ended April 15: Gold, $3000; silver, $763,627, chiefly to London. Imports: Gold, $67,217; silver, $72,691, from Mexico, South America and Australia.

Gold—With no special demand prices of gold on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4½d. per oz. for American coin. India is still taking gold from London.

Platinum—The market is good and prices are firmer. Dealers ask $41@42 per oz. per refined platinum and $43.50@44.50 for hard metal. The foreign market is reported strong.

Iridium—The metal continues scarce and quotations are firm at $62 per oz., with an advance expected.

Silver—The market has remained very steady with a good demand. This has been accentuated today by inquiries from both China and India. The new monetary schemes in the former country have stimulated buying on private account, and possibly may account to some extent for the recent improvement.

SILVER AND STERLING EXCHANGE

Apr.	13	14	15	17	18	19
New York	53⅛	53⅛	53	53	53⅛	53⅛
London	24⅜	....	24⅞	....	24⅞	24 11/16
Sterling Ex.	4.8640	4.8640	4.8645	4.8650	4.8655	4.8640

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to April 6, as reported by Messrs. Pixley & Abell:

	1910	1911	Changes
India	£1,559,300	£2,724,200	I. £1,164,900
China	1,088,500	702,800	D. 385,700
Total	£2,647,800	£3,427,000	I. £779,200

India Council bills in London brought an average of 16.09d. per rupee.

Foreign trade of the United States, three months ended March 31, as valued by the Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1910	1911
Exports	$ 412,677,322	$ 534,965,259
Imports	426,787,693	391,323,312
Excess	I.$14,110,371	E.$143,641,947
Add excess of exports, silver		5,254,261
Total		$ 148,896,208
Deduct excess of imports, gold		17,611,713
Net export balance		$ 131,284,495

The gold and silver movement in detail will be found in the table at the head of this column.

Gold and silver movement in Great Britain, two months ended Feb. 8:

	Imports.	Exports.	Excess.
Gold	£ 6,380,664	£ 6,089,922	Imp. £ 290,742
Gold, 1910	6,050,372	7,791,401	Exp. 1,741,029
Silver	2,530,267	3,890.038	Exp. 1,359,771
Silver, 1910	2,413,874	1,959,490	Imp. 454,384

Of the silver imported this year a total of £2,206,656 is credited to the United States.

Imports of gold and silver into Italy for the year were valued at $3,474,000 in 1909, and $5,989,000 in 1910; exports at $10,422,000 and $9,264,000. The excess of exports was $3,275,000 last year.

Copper, Tin, Lead and Zinc

NEW YORK

Apr.	Copper		Tin	Lead		Zinc	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
13	12⅜@12⅜	11 95@12.05	42⅛	4.40@4.42½	4.25@4.27½	5.37½@5.42½	5.22½@5.27½
14	12⅜@12⅜	11.95@12.05	42⅛	4.40@4.42½	4.25@4.27½	5.37½@5.42½	5.22½@5.27½
15	12⅛@12⅜	11.95@12.05	42⅛	4.40@4.42½	4.25@4.27½	5 37½@5.42½	5.22½@5.27½
17	12⅛@12⅜	11.95@12.05	42⅛	4.40@4.42½	4.25@4.27½	5.37½@5.42½	5.22½@5.27½
18	12⅛@12⅜	11.95@12.05	42	4.40@4.42½	4.25@4.27½	5 37½@5.42½	5.22½@5.27½
19	12⅛@12⅜	11.95@12.05	41¾	4.40@4.42½	4.25@4.27½	5.37½@5.42½	5.22½@5.27½

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Apr.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
13	53 1/16	54 5/16	57½	193¾	189	12 1/16	23⅞
14	....	....	....	....	....	....	....
15	.....	.....	.....	.....	.....	.....	.....
17	....	....	....	....	....	....	....
18	53 1/16	54 5/16	57½	193	188¾	12 1/16	23¾
19	53 3/16	54 3/16	57¼	191¾	187	12⅞	23¾

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23=5c.; £60 = 13.04c. ± £1 = ± 0.21¾c.

Copper—The market continues quiet and dull. Consumption, both in this country and in Europe, is good, but as buyers have covered their immediate requirements and are looking for lower prices, the demand has been small. This has been accentuated by the holidays abroad. For some time past, the European demand has been met to a considerable extent by dealers on the other side, who have sold material from warehouse, and as a result the stocks in warehouse there are diminishing. It is also reported that stocks in the hands of European consumers are very low. A similar situation is believed to exist in this country. At the close, Lake copper is quoted at 12⅛@12⅜c., and electrolytic copper in cakes, wirebars and ingots at 11.95@12.05c. Casting copper is quoted nominally at 11¾@12 cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 13¾c. base, carload lots at mill. Business is quiet in both sheets and wire.

The London market for standard copper was closed April 14, 15 and 17, on account of the holidays, and transactions on April 18 and 19 were very small. The market is slightly lower and closes at £53 11s. 3d. for spot, and £54 3s. 9d. for three months.

Copper exports from New York for the week were 8879 long tons. Our special correspondent gives the exports from Baltimore for the week at 3955 tons.

Stocks of copper in England and France on April 15—including 10,350 tons afloat from Chile and Australia—are reported at 79,600 long tons. Stocks in Hamburg are estimated at 10,000; in Rotterdam, 7200 tons; making a total of 96,800 tons. This is a decrease of 2760 tons from the March 31 report.

Tin—On account of the triple holiday in London, the market here has been stagnant. Consumers and dealers placed some orders on Thursday of last week, which were readily booked at from ⅜ to ½c. below the import price. The consumption of tin, which up to the beginning of this month has been excellent in this country, is now commencing to feel the general depression in business, and consequently falling off. An absence of orders from this side had its influence on the London market, which closes weak at £191 15s. for spot, and £187 for three months. April tin in this market is quoted at about 41¾ cents.

Messrs. Robertson & Bense report that receipts of tin ore and concentrates at Hamburg, Germany, in March were 1228 metric tons, of which 1218 tons came from Bolivia and 10 tons from South Africa.

Lead—The market is without special feature. There continues to be a fair demand from day to day and prices are unchanged at 4.25@4.27½ St. Louis, and 4.40@4.42½ New York.

The London market for Spanish lead is quoted at £12 17s. 6d. and English at £13 per ton.

Spelter—The market is quiet, as consumers continue to buy from hand-to-mouth. Prices are unchanged at 5.22½@5.27½c., St. Louis, and 5.37½@5.42½c., New York.

The London market is firm at £23 15s. for good ordinaries and £24 for specials.

Base price of zinc sheets $7.25 per 100 lb., f.o.b. La Salle-Peru, Ind., less 8 per cent. discount.

Other Metals

Aluminum—Business continues quiet, with only moderate sales, and prices are unchanged. We quote 20½@21c. per lb. for No. 1 ingots.

Antimony—The market has lapsed into dullness again, and business is mainly of a retail order. Quotations show no material change, 9½@9⅝c. per lb. being asked for Cookson's and 9@9⅛c. for U. S.; while 8⅜@8½c. is named for Hungarian, Chinese and other outside brands.

Quicksilver—Supplies are better, though still rather scarce. The price has been reduced, chiefly to put it nearer a parity with the London market. New York quotation is $48 per flask of 75 lb. for large lots. San Francisco, $47.50 for domestic and $45 for export orders. London price is £9 5s. per flask, with £9 4s. quoted by second hands.

Bismuth—The current price of bismuth in London is 7s. 6d.—or $1.80—per pound.

Cadmium—Current quotations are 60@70c. per lb. in 100-lb. lots, f.o.b. New York, according to quantity of metal. The price in Germany is 575@600 marks per 100 kg.; equal to 63.4c. per lb., average.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Zinc and Lead Ore Markets

Platteville, Wis., April 15—The highest price paid this week for zinc ore was $40; the base price, 60 per cent. zinc, was $39@40 per ton. The base price paid for 80 per cent. lead ore was $54 per ton.

SHIPMENTS, WEEK ENDED APR. 15

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	903,640	.....	.....
Galena	642,800	.....	.....
Platteville	626,400	.....	242,600
Cuba City	84,000	.....	.....
Harker	78,280	.....	.....
Hazel Green	50,000	.....	.....
Linden	.....	.....	80,000
Total	2,385,120	.....	322,600
Year to date	39,296,750	2,220,635	10,223,990

Shipped during week to separating plants, 2,061,530 lb. zinc ore.

Joplin, Mo., April 15—The highest price paid for zinc sulphide ore was $43.50 per ton, the assay base ranging from $35 to $40.50 per ton of 60 per cent. zinc. Scale base, $39.47. Zinc silicate ore sold at $20@22 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $38.04. The highest price paid for lead was $57, the average of all grades being $55.80 per ton.

A tornado swept part of the district during the week and put a number of mines out of commission. This, with mines closed down for repairs and for other purposes, reduces the current output about 1000 tons. The zinc shipment is larger than the preceding three weeks.

and the lead shipment is lower. Compared with a year ago the shipments of both ores are less.

SHIPMENTS, WEEK ENDED APR. 15

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	3,925,840	.....	625,480	$92,103
Joplin	3,000,530	.....	308,240	68,640
Galena	1,632,390	.....	92,390	33,600
Duenweg	608,410	87,920	50,460	14,026
Alba-Neck	309,330	.....	16,380	6,946
Oronogo	318,230	.....	45,340	6,593
Quapaw	326,890	.....	.....	5,230
Carl Junction	259,370	.....	.....	5,187
Sarcoxie	182,880	.....	.....	3,473
Jackson	140,670	.....	22,890	3,300
Aurora	128,770	.....	.....	2,446
Spring City	84,900	25,130	17,590	2,405
Granby	.....	159,310	9,200	2,165
Carthage	86,830	.....	9,530	1,906
Stott City	85,700	.....	.....	1,628
Cave Springs	73,930	.....	.....	1,404
Totals	11,164,670	272,360	1,197,500	$251,052
15 weeks	140,819,300	9,233,420	25,488,310	$3,633,174
Blende val., the week,	$214,366;	15 wks.,		$2,817,383
Calamine, the week,	3,270;	15 wks.,		110,239
Lead, the week,	33,416;	15 wks.,		705,552

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1910	1911	1910	1911	1910	1911
January	$47.31	$41.85	$45.16	$40.55	$56.99	$55.68
February	40.69	40.21	39.47	39.16	53.64	54.46
March	43.60	39.85	39.71	38.45	51.26	54.77
April	41.00	.....	39.33	.....	49.72	.....
May	40.19	.....	37.51	.....	48.16	.....
June	40.20	.....	37.83	.....	48.80	.....
July	39.63	.....	36.80	.....	48.59	.....
August	40.13	.....	37.32	.....	49.75	.....
September	43.45	.....	39.96	.....	54.73	.....
October	43.31	.....	40.50	.....	53.18	.....
November	47.20	.....	43.20	.....	54.80	.....
December	42.50	.....	40.70	.....	55.70	.....
Year	$42.43	.....	$39.79	.....	$52.12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

New Caledonia Ores

Shipments of ores other than nickel from New Caledonia in 1910 included 800 tons of copper ore, against 7 tons in 1909; 44 tons lead, the first shipment; 28,244 tons chrome ore, a decrease of 3892 tons. In 1909 there were 979 tons cobalt ore exported, but no cobalt was shipped last year.

CHEMICALS

New York, April 19—The general markets are still quiet, but business in some lines is looking up a little.

Copper Sulphate—The shortage of supplies has resulted in an advance of prices. The quotation is now $4.50 per 100 lb. for carload lots, with the usual advance for small orders.

Arsenic—The market continues dull and rather overstocked. Quotations are unchanged at $1.85@1.90 per 100 lb. for white arsenic.

Nitrate of Soda—Business continues quite on a fair scale. Supplies seem to be abundant, and prices are unchanged, 2.10c. per lb. being asked for both spot and future positions.

Petroleum

Exports of mineral oils from the United States, three months ended March 31, in gallons:

	1910	1911
Crude petroleum	30,365,912	29,969,618
Naphthas	17,846,758	15,247,706
Illuminating oils	219,216,018	250,418,092
Lubricating and paraffin	36,776,700	43,112,997
Residuum	22,187,612	34,416,275
Total	326,393,000	373,164,688

The total increase this year was 46,771,688 gal., or 14.4 per cent.

MINING STOCKS $

New York, April 19—Continued dullness has characterized the general stock market, which was also broken by a two days' holiday, the Exchange adjourning over Friday and Saturday. The tendency of prices was downward, but declines were small. On April 17 there was a drop in the fertilizer stocks, American Agricultural Chemical going off 1½ and Virginia-Carolina 2½ points.

Today there was a marked increase in the volume of business, accompanied by a general small decline in prices.

Miami Copper stock—$3,370,275—has been listed on the Exchange. Sales were made at $18⅜@18½. There was one sale of Homestake, 20 shares, at $86 per share.

The Curb market was also dull. The chief activity was in the Cobalt stocks, Kerr Lake and Cobalt Central leading, but with small changes in price. Porcupine Central sold at 55@56c. per share. The copper stocks were quiet and rather weak; but changes were only fractional. Tonopah and Tonopah Extension, among other stocks, recorded a few sales.

Sales at auction in New York, April 13, included 50 shares Guanuajuato Consolidated Mining and Milling Company, $5 par, 60c. per share; 50 shares Goldfield Consolidated, $10 par, $6 per share; 100 shares Sloss-Sheffield Steel and Iron common, $100 par, $52.12½ per share, and 300 shares preferred, $100 par, $107.50 per share; 200 shares Anaconda Copper, $25 par, $37.25 per share; 10 shares United States Steel preferred, $100 par, $119 per share; $50,000 Columbus & Hocking Coal and Iron bonds, 45½ per cent. of par; $100,000 Commercial Mining and Milling Company bonds, $800 for the lot.

Boston, April 18—Mining stocks hung fire until today when general weakness came in and prices were groggy. This was largely due to the heaviness of the New York list, especially Amalgamated.

Calumet & Hecla is off to $481 a share. A brokerage house which fought against the consolidation of Osceola is out again asking for proxies to be used against the merger at the postponed meeting April 24. Conspicuous in the weakness were Calumet & Arizona and North Butte. The former is off to $47.75 and the latter touched $26.25. There was no special cause for the weakness in either case. Copper Range is selling at $60,

COPPER PRODUCTION REPORTS

Copper contents of blister copper, in pounds

Company	January	February	March
Anaconda	21,000,000	20,900,000	21,900,000
Arizona, Ltd.	3,024,000	2,860,000	3,094,000
Balaklala	932,452	676,605	.....
Copper Queen	7,208,227	7,114,278	7,333,629
Calumet & Ariz.	2,044,000	1,762,000	1,960,000
Detroit	2,017,397	1,918,365	1,914,710
East Butte	1,134,000	1,065,000	.....
Imperial	.....	.....	.....
Nevada Con.	5,268,954	4,992,553	.....
Old Dominion	2,095,000	1,890,000	.....
Shannon	1,250,000	1,166,000	1,322,000
Superior & Pitts.	2,014,000	1,808,000	2,540,000
United Verde*	3,000,000	2,800,000	3,000,000
Utah Copper Co.	6,707,116	7,329,326	.....
Lake Superior*	15,700,000	17,750,000	20,000,000
Non-rep. mines*	13,900,000	12,600,000	.....
Total production.	87,385,146	86,032,127	.....
Imports, bars, etc.	18,648,920	23,935,222	.....
Total blister	106,034,066	109,967,349	.....
Imp. in ore & matte	5,377,700	5,981,487	.....
Total	111,411,766	115,948,836	.....
Brit. Col. Cos.:			
British Col. Copper	.....	767,470	.....
Granby	.....	1,633,300	.....
Mexican Cos.:			
Boleo	2,647,173	2,226,560	2,700,880
Cananea	3,504,000	3,906,000	3,542,000
Moctezuma	1,738,429	1,950,475	2,049,150

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
III, 1910	120,067,467	62,944,818	40,585,767
IV	117,477,639	67,985,951	31,332,434
V	123,242,476	59,305,222	45,495,400
VI	127,219,188	53,363,196	65,895,948
VII	118,370,003	56,708,175	59,407,167
VIII	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,912
XI	119,353,463	60,801,992	67,424,316
XII	123,339,219	43,594,018	88,104,075
Year 1910	1,452,122,120	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739
II	109,828,297	50,518,998	45,111,019
III	130,532,080	66,080,789	59,081,127

	Visible Stocks.		
	United States.	Europe.	Total.
IV, 1910	123,824,874	249,625,600	373,450,474
V	141,984,159	246,870,400	388,854,559
VI	160,425,973	239,142,400	399,568,373
VII	168,386,017	232,892,800	401,278,818
VIII	170,640,678	222,320,000	392,960,677
IX	168,881,245	218,444,800	387,326,045
X	148,793,714	211,276,800	360,070,514
XI	139,261,914	198,060,800	337,322,714
XII	130,389,069	193,200,000	323,589,069
I, 1911	122,030,195	236,629,120	358,649,315
II	142,439,490	236,992,000	379,431,190
III	156,637,770	233,385,600	390,023,370
IV	162,007,934	223,014,400	385,022,334

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month. From Jan. 1, 1911, stocks at Hamburg and Rotterdam are included in the visible stocks for Europe.

Lake is off to $30, even although favorable reports come from the mine.

The Curb has also witnessed a quiet state of affairs during the week with prices off during the time. Chino is off to $4.75 and Rhode Island Coal has been notably weak, selling off to $3.75 per share.

Assessments

Company	Delinq	Sale	Amt
Alpha Con., Nev.	May 9	May 31	$0.05
Andes, Cal.	May 2	May 23	0.10
Amer. M. Co., Ida.	May 6	May 27	0.001
Bell, Ida.	Apr. 29	June 6	0.04
Bonanza Mountain, Ida.	Apr. 28	May 27	0.001
Challenge, Cal.	Apr. 26	May 27	0.05
Confidence, Nev.	May 11	May 31	0.20
Crown Point, Nev.	Apr. 7	Apr. 28	0.10
Ely Consolidated, Nev.	May 2	June 22	0.05
Exchequer, Cal.	Apr. 26	May 18	0.05
Federal Ely, Nev.	Apr. 22	May 8	0.01
Gould & Curry, Nev.	May 12	June 1	0.10
Log Cabin, Ida.	Apr. 24	May 24	0.006
Majestic, Utah	Apr. 11	.....	0.10
Miner Inv. Co., Ida.	Apr. 28	May 27	0.0015
Potosi, Nev.	May 8	May 31	0.10
Scorpion, Nev.	May 4	May 24	0.03
Sierra Nevada, Nev.	May 4	May 25	0.10
Snowstorm, Cal.	Apr. 10	May 10	0.003
Snowstorm, Ida.	Apr. 14	May 12	0.005
Tintic Standard, Utah	Apr. 25	.....	0.005
Trans.-Continental, Ida.	May 3	May 27	0.002
Union Con., Nev.	Apr. 11	May 3	0.10
Utah-Arizona, Ariz.	May 20	May 31	0.005
Yankee Con., Utah	May 1	.....	0.02
Yellow Jacket, Nev.	May 8	June 8	0.10

Monthly Average Prices of Metals

SILVER

Month.	New York.			London.		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24.865
February	51.472	51.534	52.222	23.706	23.794	24.081
March	50.468	51.454	52.745	23.227	23.690	24.324
April	51.428	53.221	.....	23.708	24.483	.....
May	52.905	53.870	.....	24.343	24.797	.....
June	52.538	53.462	.....	24.166	24.651	.....
July	51.043	54.150	.....	23.519	25.034	.....
August	51.125	52.912	.....	23.588	24.428	.....
September	51.440	53.295	.....	23.743	24.567	.....
October	50.923	55.490	.....	23.502	25.596	.....
November	50.703	55.635	.....	23.351	25.680	.....
December	52.226	54.428	.....	24.030	25.160	.....
Total	51.502	53.486	.....	23.706	24.670	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York.				London, Standard.	
	Electrolytic		Lake.			
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12.295	13.870	12.680	60.923	55.604
February	13.332	12.256	13.719	12.611	59.388	54.970
March	13.255	12.139	13.586	12.447	59.214	54.704
April	12.733	.....	13.091	.....	57.238	.....
May	12.550	.....	12.885	.....	56.313	.....
June	12.404	.....	12.798	.....	55.310	.....
July	12.215	.....	12.570	.....	54.194	.....
August	12.490	.....	12.715	.....	55.733	.....
September	12.379	.....	12.668	.....	55.207	.....
October	12.553	.....	12.788	.....	56.722	.....
November	12.742	.....	12.914	.....	57.634	.....
December	12.581	.....	12.863	.....	56.769	.....
Year	12.738	.....	13.039	.....	57.054	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

TIN AT NEW YORK

Month.	1910.	1911.	Month.	1910.	1911.
January	32.700	41.255	July	32.695	.....
February	32.920	41.614	August	33.972	.....
March	32.403	40.157	September	34.982	.....
April	32.976	.....	October	36.190	.....
May	33.125	.....	November	36.547	.....
June	32.769	.....	December	38.199	.....
			Av. Year	34.123	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	4.440	4.445	4.266	13.328	13.043
March	4.459	4.394	4.307	4.238	13.063	13.122
April	4.376	.....	4.225	.....	12.641	.....
May	4.315	.....	4.164	.....	12.550	.....
June	4.343	.....	4.207	.....	12.688	.....
July	4.404	.....	4.291	.....	12.531	.....
August	4.400	.....	4.290	.....	12.513	.....
September	4.400	.....	4.289	.....	12.582	.....
October	4.400	.....	4.271	.....	13.091	.....
November	4.442	.....	4.314	.....	13.217	.....
December	4.500	.....	4.363	.....	13.197	.....
Year	4.446	.....	4.312	.....	12.920	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5.452	5.951	5.302	23.350	23.887
February	5.569	5.518	5.419	5.368	23.188	23.276
March	5.637	5.563	5.487	5.413	23.031	23.016
April	5.439	.....	5.289	.....	22.469	.....
May	5.191	.....	5.041	.....	22.100	.....
June	5.128	.....	4.978	.....	22.094	.....
July	5.152	.....	5.002	.....	22.406	.....
August	5.279	.....	5.129	.....	22.800	.....
September	5.514	.....	5.364	.....	23.165	.....
October	5.628	.....	5.478	.....	23.900	.....
November	5.976	.....	5.826	.....	24.083	.....
December	5.624	.....	5.474	.....	24.019	.....
Year	5.520	.....	5.370	.....	23.050	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	$19.90	$15.90	$17.98	$14.40	$17.94	$14.75
February	18.96	15.90	17.21	14.50	17.38	14.81
March	18.53	15.90	16.93	14.65	17.00	14.96
April	18.28	.....	16.84	.....	16.75	.....
May	17.10	.....	15.94	.....	16.18	.....
June	16.52	.....	15.60	.....	15.53	.....
July	16.40	.....	15.40	.....	15.40	.....
August	16.09	.....	14.89	.....	15.16	.....
September	15.92	.....	14.73	.....	14.93	.....
October	15.90	.....	14.05	.....	14.88	.....
November	15.84	.....	14.26	.....	14.78	.....
December	15.90	.....	14.15	.....	14.65	.....
Year	$17.10	.....	$15.65	.....	$15.83	.....

STOCK QUOTATIONS

COLO. SPRINGS Apr. 18

Name of Comp.	Bid.
Acacia	.03½
Cripple Cr'k Con.	.01
C. K. & N.	.15
Doctor Jack Pot	.05½
Elkton Con.	.62
El Paso	.64
Findlay	.05
Gold Dollar	.11
Gold Sovereign	.02½
Isabella	.10
Jack Pot	.05
Jennie Sample	.10½
Lexington	.01
Moon Anchor	.02½
Old Gold	.03
Mary McKinney	.35
Pharmacist	‡.02
Portland	1.00
Vindicator	.85
Work	.02½

SALT LAKE Apr. 18

Name of Comp.	Bid.
Beck Tunnel	.28½
Black Jack	.19
Carisa	.18
Cedar Talisman	.48
Colorado Mining	.47
Columbus Con.	.31½
Daly Judge	4.45
Grand Central	.80
Iron Blossom	1.27½
Little Bell	.47
Lower Mammoth	.12
Mason Valley	7⅞
May Day	.20
Nevada Hills	3.05
New York	.10
Prince Con	.51
Silver King Coal'n	1.55
Sioux Con.	.29½
Uncle Sam	.66
Yankee	.16

TORONTO Apr. 18

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.10	Dome Exten	.54
Hudson Bay	.98	Pearl Lake	.50
Temiskaming	.68	Dobie	3.10
Wettlaufer-Lor	.90	West Dome	2.02
Hollinger	9.00	Standard	.34½
Preston E. D.	.35	Apex	.18
Porcu. Gold.	.54	Canada	1.10
Porcu. Tisdale	.08	Crown Char.	.56
Imperial	.10	Carnation	.36
Central.	.59	Swastika	.54

SAN FRANCISCO April 18

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	.14
Belcher	.85
Best & Belcher	.41
Caledonia	.45
Challenge Con.	.19
Chollar	.21
Confidence	.75
Con. Virginia	1.62½
Crown Point	.83
Gould & Curry	.25
Hale & Norcross	.32
Mexican	.41
Occidental	.66
Ophir	1.95
Overman	.41
Potosi	.39
Savage	.41
Sierra Nevada	.52
Union Con.	1.95
Yellow Jacket	½

Name of Comp.	Bid
MISC. NEV. & CAL.	
Belmont	5.95
Jim Butler	.21
MacNamara	.11
Midway	.25
Mont.-Tonopah	.70
North Star	.12
West End Con.	.58
Atlanta	.09
Booth	.10
C.O.D. Con.	.08
Comb. Frac.	.11
Jumbo Extension	.29
Oro	.05
Silver Pick	.05
St. Ives	.20
Tramps Con.	.02
Argonaut	1.70
Bunker Hill	‡6½
Cent. Eureka	1.25
So. Eureka	7.50

N. Y. EXCH. Apr. 18

Name of Comp.	Clg.
Amalgamated	60⅛
Am. Agri. Chem.	54½
Am.Sm.&Ref.,com	71⅞
Am. Sm.& Ref., pf.	104
Anaconda	36⅛
Batopilas Min	2
BethlehemSteelpf	61¾
Chino	21⅞
Comstock Tunnel	.28
Federal M.& S., pf.	59½
Goldfield Con.	6⅛
Great Nor., ore ctf.	60¼
Homestake	85
Miami Copper	18¼
Nat'nalLead,com.	51
National Lead, pf.	105½
Nev. Consol	17⅝
Pittsburg Coal, pf.	79⅛
Ray Con.	15⅝
RepublicI&S,com.	32
Republic I & S, pf.	95
SlossSheffi'd,com.	51¾
Sloss Sheffield, pf.	‡105
Tennessee Copper	35¾
Utah Copper	42¾
U. S. Steel, com.	74⅜
U. S. Steel, pf.	119
Va. Car. Chem.	61⅝

N. Y. CURB Apr. 18

Name of Comp.	Clg.
Ariz.-Cananea	‡3⅜
Barnes King	‡.18
Braden Copper	4⅛
B. C. Copper	5¼
Buffalo Mines	2.20
Butte Coalition	16¾
Caledonia	‡⅞
Calumet & Mont.	‡.20
Cobalt Central	.07
Con. Ariz Sm.	1⅜
Davis-Daly	1⅛
Ely Con.	.23
Florence	1½
Giroux	5⅞
Greene Cananea	6
Greenwater	‡.05½
Guanajuato	3⅛
Guerrero	‡1⅛
Guggen. Exp.	188
Inspiration	67⅛
Internat. S. & R.	‡131
Kerr Lake	6⅛
La Rose	4⅝
McKinley-Dar-Sa.	1⅝
Min. Co. of A. new	4¾
Moneta Porc.	.18
Mont Shoshone	‡.04
Nev. Utah M. & S.	⅜
Nipissing Mines	10¼
Ohio Copper	1¾
Pacific Sm. & M.	⅛
Precious Metals	⅜
Ray Central	1⅛
Red Warrior	‡1⅜
South Utah M. & S.	⅜
Standard Oil	669
Stewart	1
Tonopah	6½
Tonopah Ex.	1.05
Tri-Bullion	⅛
Tularosa	⅛
Union Mines	⅛
Yukon Gold	3⅞

LONDON Apr. 19

Name of Com	Clg.
Camp Bird	£1 11s 0d
Dolores	1 10 0
El Oro	1 4 3
Esperanza	1 13 9
Mexico Mines	7 7 6
Oroville	0 6 0
Stratton'sInd.	0 2 0
Tomboy	0 15 0

BOSTON EXCH. Apr. 18

Name of Comp.	Clg.
Adventure	5
Algomah	7
Allouez	32
Am. Zinc	23¾
Arcadian	2⅛
Arizona Com.	12⅞
Atlantic	3
Bonanza	⅛
Boston & Corbin	11⅛
Butte & Balak	4⅜
Calumet & Ariz.	47¾
Calumet & Hecla	481
Centennial	11⅛
Con. Mercur	8
Copper Range	60
Daly-West	3½
East Butte	11½
Franklin	9½
Granby	30⅛
Hancock	20
Hedley Gold	15¼
Helvetia	1¾
Indiana	12
Isle Royale	12¼
Keweenaw	2
Lake	30
La Salle	4
Mass	5⅜
Michigan	1¾
Mohawk	36
New Arcadian	2½
North Butte	26¾
North Lake	5¼
Ojibway	5
Old Dominion	37
Osceola	100
Parrot	11½
Quincy	67½
Shannon	10
Shattuck-Ariz.	17
Superior	32
Superior & Bost.	3⅛
Superior & Pitts.	14
Tamarack	38
Trinity	4
U. S. Smelting	33½
U. S. Smelt'g, pf.	45⅛
Utah Apex	2½
Utah Con.	13¼
Victoria	1⅜
Winona	6
Wolverine	105
Wyandot	1¼

BOSTON CURB Apr. 18

Name of Comp.	Last
Ahmeek	165
Bingham Mines	1⅜
Boston Ely	1⅛
Boswyocolo	.08½
Cactus	.12
Calaveras	2
Champion	.01½
Chief Cons	1½
Corbin	3½
Cortez	1½
Crown Reserve	3½
First Nat. Cop.	1⅜
Live Oak	‡18½
Mackinaw	‡.02
Majestic	.42
Nat'l Mine & Ex.	.01
Nevada-Douglas	2
Oneco	1½
Raven Copper	.20
Rhode Island Coal	4⅜
San Antonio	‡3½
South Lake	4½
Trethewey	‡.90
Tuolumne Copper	4½
United Zinc, pfd.	‡4½
Vulture	7⅛
Yuma	.02

‡Last quotation.